SCIENTIFIC AMERICAN

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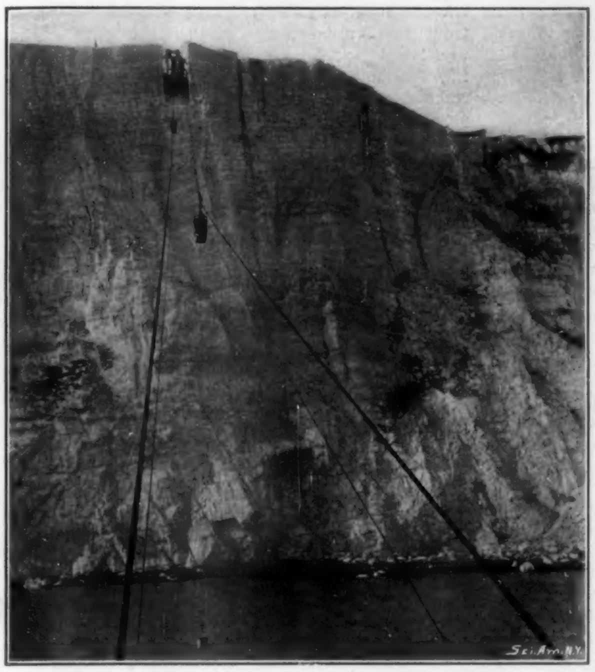
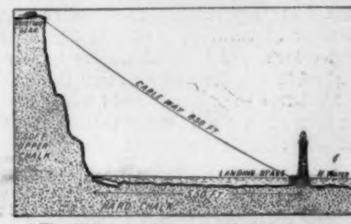
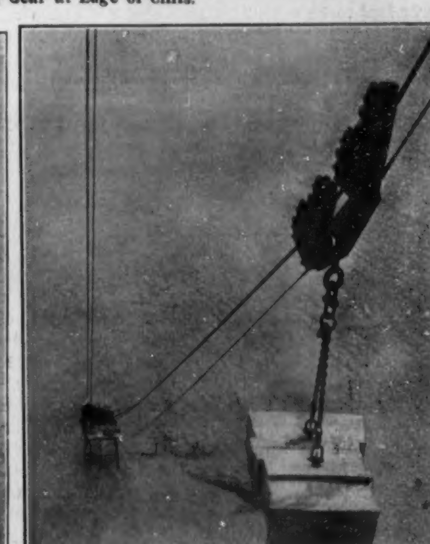


Beachy Head Chalk Cliffs, from the Erecting Stage; Height, 460 Feet.



The Cliff, Cableway and Lighthouse.

The Cableway Hoisting Gear at Edge of Cliffs.



Four-Ton Block Descending Cableway.

The Erecting Stage and Foundations.

BUILDING THE NEW BEACHY HEAD LIGHTHOUSE ON THE ENGLISH CHANNEL.—[See page 294.]

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NEW YORK, SATURDAY, NOVEMBER 9, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

NEW DEPARTMENT OF THE SCIENTIFIC AMERICAN.

In response to many requests from our readers, we have decided to publish, from time to time, a special department of the SCIENTIFIC AMERICAN devoted exclusively to patents and inventions.

Under this head we shall give the latest news of the day relating to the United States Patent Office; and it will include illustrated notices of recently issued patents, which latter will be selected on account of their interest and promise. There will also be a special section devoted to legal notes, and digests of legal decisions relating to patents and trade marks.

The editors are satisfied that the comprehensive scope of these data, coupled with the publication, weekly, of the index of inventions, will render the new department the most compendious and reliable source of information published on the subject.

FORCED VERSUS NATURAL DRAFT.

The forced draft controversy is still with us, and promises to be a fruitful theme of discussion among marine engineers for many a year to come. No doubt at one time forced draft was a fruitful cause of breakdowns at sea; but that was in a day when the scope and limitations of the system were not well understood. If the doors of a boiler furnace that is being forced under so many inches of air-pressure be suddenly swung open by the fireman, the rush of cold air impinging on the tube sheet will induce severe contraction strains and the tube ends will begin to leak. To-day, however, the modified forced draft which is being used on some of the largest and fastest ships is giving most effective service, and this without any serious increase in the boiler repair bill over what would be expected in boilers fired under natural draft. It is certain that there is a more economical consumption of fuel, and that a higher rate of horse power per ton weight of motive power can be realized. On the other hand, we find that some of the most powerful of the steamship companies are bitterly opposed to forced draft and will not contemplate its use for a moment. Among these may be mentioned the North German Lloyd and the Cunard lines, which, in spite of the brilliant success of the "Deutschland" of the Hamburg-American line, have very little that is good to say of forced draft, even in a modified form. The "Kronprinz," and the huge "Kaiser Wilhelm II." now building for the North German Lloyd, have natural draft, and it is significant that the steamship "Bremen," which was burned a little over a year ago at the Hoboken fire, and has just made her maiden trip to this port after undergoing a thorough reconstruction, has had her old boilers, which were equipped with the Howden forced draft, entirely removed and new and larger boilers operated on the natural draft system installed. Speaking of the latter vessel, it may be quoted as a case of remarkable speed in shipyard work that this great steamer, which was completely gutted at the time of the Hoboken disaster, has within twelve months been towed to Newport News, steamed over to Stettin, been cut in two and lengthened 25 feet, had new boilers and entirely new interior fittings for freight and passengers, and has already completed her maiden trip to this country, steaming, by the way, a good two knots better than her former speed of fourteen knots an hour.

ACCIDENT TO THE 10-INCH BROWN SEGMENTAL WIRE GUN.

Our readers will remember that the 10-inch segmental wire gun, which has been built for the United States army, was found on trial to possess too small a powder chamber for the grade of smokeless powder with which the government tests were being carried on, and that the weapon was returned to the makers for the necessary enlargement of the chamber. The change was made and the gun returned to Sandy Hook to complete its trials. In the first test, with a 575-pound projectile and a charge of 150 pounds of powder, a muzzle velocity of 2,230 feet per second was achieved, and apparently no damage had been done to the gun. In the next round the powder charge was raised to 175 pounds of ntiro-cellulose powder. When the gun was fired the overhang of the steel trunnion jacket at the breech was blown entirely away, carrying with it the breech mechanism. In spite of the fact that part of the energy of the explosion was expended in blowing a mass of metal weighing 2,000 pounds 200 feet to the rear, the projectile, gaged by the indicators, showed a muzzle velocity of 2,364 feet per second. The powder pressure in the chamber at the first shot was 28,700 pounds to the square inch, and it is reasonable to assume that had the breech not been blown away the contract velocity of 2,800 feet per second would have been secured. At the present writing it would seem that the failure does not affect the principle of the gun, which consists in building up the inner tube of overlapping steel plates and wrapping the tube with wire, until the desired initial compression of the tube is secured.

MARCONI TELEGRAPHY ON THE HIGH SEAS

A recent successful exchange of messages between two vessels of the Cunard Line, when they were passing each other in mid-ocean at a distance estimated at from 50 to 70 miles, must have brought home to a great many of us, once more, a strong sense of the almost weird powers of wireless telegraphy. It furnishes another striking instance of how the wonders of yesterday become the commonplaces of to-day. We well remember, during the "America" Cup contests of two years ago, being in the chart room of the "Grande Duchesse" with Marconi, while the vessel was feeling her way down the Bay enveloped in a dense fog, and how, suddenly, the Morse repeater began to unwind its little strip of dot-and-dash messages, a visible evidence of the fact that fifteen miles away the Marconi operator on the Bennett-Mackay cable-ship outside Sandy Hook was asking us whether we were tangled up in the fog which he could see hanging over the Upper Bay.

It is all something of an old story now; yet we think the captains of these two ships must have felt just a touch of the old wonderment as they heard themselves accosted far out in mid-Atlantic. Yet, for all we can see, these are but the beginnings of wireless telegraphy.

GAS ENGINE PLANTS.

The use of gas engines in electric plants is one of the interesting features of a paper on "Gas Engines" read by M. Deschamps at the last Congress of Electric Station Syndicates. As early as 1886 the Dessau central station used two gas engines of 60 horse power, and in 1889 the Alimentation Exposition at Cologne was lighted by a dynamo driven by a 4-cylinder 100 horse power gas engine. At the present time a number of large plants are using gas engines. At first the engines were of small power, and in the early stations there was a great number of units and a wide variety of types used. Thus in the Kasan electric plant there are two engines of 50 horse power and six of 80, and in the Saint-Gall station are found one of 150 horse power, one of 100, two of 60, two of 30 and one of 25 horse power. At present the ideas have changed on this point, and stations are laid out on another plan. It is found advisable to have a series of engine and dynamo groups which have as nearly as possible the same power and the same type of machine, allowing the use of interchangeable parts. Thus at Brussels, an up-to-date station, there are six of such groups, of 120 horse power each, and at Valenciennes are installed four groups of 160 horse power. One of the most interesting of the modern stations is that of the city of Bâle, which has its water supply entirely furnished by gas engines, with great economy. This has been running since 1894 with great success, and the city of Bâle has lately decided to use gas engines for the city lighting station, with groups of two dynamos driven by a gas engine. The gas is furnished by generators, using low-grade gas, and piping connects with the city mains, which will be used in case of need. The station has already three such dynamo groups in operation, and is provided for future additions. This disposition renders it easy to vary the energy used according to the different hours of lighting. Another modern station is the Oerlikon plant, which uses monophase alternators in parallel. In this case two gas engines of 140 horse power are used to drive two alternators each.

THE NEW YORK CENTRAL TUNNEL.

The plans for the reconstruction of the New York Central Tunnel beneath Park Avenue, which were recently made public by the company, are distinctly disappointing; for the proposed remedy is, on the face of it, a mere makeshift. The steam locomotives are to be retained, and consequently the noxious gases that are poured forth from every passing train will continue to vitiate the tunnel atmosphere. The company's proposal is to remove the masonry partition walls which separate the two outside tracks from the inside express tracks, and substitute therefor two lines of steel columns. It is claimed that this alteration will permit the gases to escape directly from the engines using the outside track to the openings which already exist above the express tracks. It is true this may prove something of relief to trains that now use the side tunnels, but in just the exact proportion that the side tunnels are relieved, the condition of things will become worse in the center of the tunnel on the main tracks where, at present, in the heat of the summer, travel is scarcely endurable. There is only one way to solve this problem and that is to abolish coal-burning locomotives altogether, and substitute electric traction. The New York Central Company can find plenty of electrical engineers who are prepared to devise a system by which the tunnel, the terminal yard and the train-shed can be operated exclusively by electric power, and in view of the enormously valuable character of the franchises which New York city has granted to the New York Central Company, that corporation should not hesitate for a moment to incur the expense, admittedly large, of putting in an electric installation. The public will never be satisfied with anything short of this, for the reason that nothing less can meet the necessities of the case.

BALLOON AND AUTOMOBILE MATCH.

A rather novel match between a balloon and an automobile occurred not long ago in the neighborhood of Paris. The "Alliance," a balloon of 1,500 cubic yards, started from the gas-works at Reuil, in the suburbs, having on board Maurice Farman and Georges Leys, the well-known chauffeur. At the same time a 12-horse power Panhard automobile, piloted by Marcel Cohen, with four other persons, started to give chase to the balloon. It was thought at first that this would be an easy matter, but the balloon was carried about in so many different directions by the air-currents, that the pursuit became difficult. After covering a distance of 120 miles, the automobile party arrived at the station of La Brosse, but found that the balloon had landed there shortly before them and that the aeronauts had already taken the train for Paris, quite satisfied at having won the match.

RECENT AUTOMOBILE ACCIDENTS.

The frequency with which automobile accidents of a fatal or very serious character are happening is not to be attributed to increasing carelessness among automobilists, but rather to the fact that the pastime is growing in favor, and that with a rapid increase in the number of automobiles, we must look, as in the case of the bicycle, for an increasing chapter of accidents. Without implying that what follows has any special application to the recent accidents near Tuxedo or on Long Island, we wish to draw attention to the fact that a mere acquaintance with the management and control of an automobile under *normal* conditions, does not qualify the owner as an expert under all-round conditions. The mechanical manipulation of an automobile may be learned by any intelligent person, but there are to be considered a thousand-and-one contingencies arising from the accidents of wind and weather, the conditions of the road, as regards its grades, surface, curvature, etc., and also, and most important of all, there are the risks which arise from other traffic in city or country. All these external conditions of automobiling can only be fairly mastered as the result of lengthy experience. Thus, there is the most important question of the condition of the road surface as affecting the steering qualities of the machine. Unless he has been warned to guard against it, or has the good fortune to be an old bicycle rider, the inexperienced automobilist will get into trouble should he endeavor to make moderately sharp turns on wet asphalt, or on a hard road covered with mud of a thoroughly greasy consistency. In any good make of automobile the question of the strength of the parts has been so thoroughly worked out that it is probably a rare occurrence that accidents are attributable to structural weakness. In most cases they are probably due to the craze for extremely high speed which has taken possession, as it was bound to do, of the automobile world. America has entered into the lists of competition for the world's record in speed, and already we understand that a racing machine of the enormous capacity of 125 horse power and a guaranteed speed of 75 miles an hour is about to be built. The question arises what in the world is the owner going to do with this machine when he gets it. There are no roads in this country, not even on Long Island, where such a speed could be attained, except at enormous risk, and we very much question whether the tires of this heavy machine could stand the side stresses involved in swinging around the ends of a mile trotting track at a gait which is only occasionally reached by the fast-

est express train. Until the owner of an automobile has run his machine over a wide variety of roads, and under many conditions of traffic, he should be content with a speed of 12 to 18 miles an hour, and then as he becomes a more perfect judge of speed and distance it will be time enough for him to open the throttle. As matters are now going we are likely to have the same experience with the automobile as with the bicycle. Unless the restrictions as to speed are imposed accidents will become more frequent as the number of owners increases. Restrictions by law are frequently irksome, and are apt at times to be unreasonable; hence it is to the interest of automobilists as a body to voluntarily keep down speed both in town and country to a safe limit.

THE NEW COAST SIGNAL SERVICE.

BY GEORGE E. WALSH.

Prior to the war with Spain we had practically no coast signal service along either of our extensive sea coasts, and when the war broke out the Navy Department made haste to provide some adequate means of protecting the Atlantic seaboard from unexpected attack. It was one of the creditable operations of the war that the department succeeded within a short time in establishing a signal service from Maine to Florida, which kept every important point guarded. There were fifty signal stations established between these two points, and they were sufficiently close together at important points to prevent the approach of any hostile fleet undiscovered. A large sum of money was spent within a few weeks in perfecting this signal service, and no one outside of the government employés knew how perfectly well the whole Atlantic seaboard was covered.

The abandonment of this intricate and costly service at the close of the war was criticised by many, and an effort was made to induce the department to adopt a permanent coast signal service similar to that maintained by France and England. This, however, would have been an immensely costly outlay of funds, far greater, on account of the great extent of our seacoast, than the amount spent in any European country. The Navy Department, however, carefully worked out a system of coast signal service which to-day is so efficient and inexpensive that it deserves greater praise than it receives. It is maintained as a separate branch of the Navy Department, and in times of peace it has nothing to do except to keep its system in such a state of efficiency that on short notice it can perform valuable work.

When the service established its series of stations along the coast it built fifty portable houses or stations. These frame structures could be erected and taken down on short notice. When the war closed the service was discontinued; but the portable station houses were taken apart and stored at various points near the site of the station. The new service contemplates using these portable signal stations in times of war. Each station house and all the signaling equipment are kept in stock, so that on short notice they can be hurried down by fast freight to their positions and put up within a few hours. Each signal station house is numbered, and a chart of the service shows corresponding numbers along the coast and at what point the portable station house is kept in stock. The coast is divided into districts, and in each district there is a certain number of stations. The cost of storage is very small.

To man these signal stations would require a large force, and in the event of hostilities the navy could ill afford to spare the necessary number of efficient men. Green recruits could not well undertake the work; for the importance of the signal service is too great to be jeopardized by men unfamiliar with it. At the outbreak of the war the signal service included a number of men trained for the work, and volunteers were immediately enlisted and trained by the veterans. By these emergency measures the coast was in time carefully protected; but the situation at the declaration of hostilities was critical.

To avoid a crisis which might prove disastrous to the country, the Coast Signal Service has perfected a system by which the Naval Militia of the different States will take immediate charge of the signal stations in times of war. A large force of the Naval Militia along the Atlantic coast is being drilled in signaling, and these men could be drawn upon on a day's notice for effective work. Many of them saw active service in the Signal Service during the war, and they have further increased their skill and efficiency by a thorough course of study and training under the supervision of prominent officers in the navy.

So effective has this system become that naval officers do not hesitate to say that the signal service is ready for any emergency, while the cost in times of peace is trifling. In the event of war word would be sent out to ship the different signal station houses to their respective positions, and the complete equipment would follow. Then the demand would be made upon the State militia officers for signalmen, and they would be hurried to their posts. Thus within a day or two the whole coast could be amply guarded by fifty different signal stations thoroughly equipped for all work and in the hands of competent men.

Each station is supposed to be equipped with a telegraph instrument and every code of signals used by warships and the merchant marine. The signalmen are then able to exchange messages with any approaching ship, no matter of what nationality or from what port of the world. Each station requires five men. There are two experienced signalmen, two expert telegraphers, and a cook. This provides for night and day work, a signalman and a telegrapher being on duty all the time. In times of war the signalmen and telegraph operators are regularly enlisted as petty officers, and the cook as a common seaman. The telegraph operators must be qualified experts, familiar with the signs and codes used by the signal service. The small wooden signal station building is arranged to provide comfortable quarters for these five men, and they would live there night and day in winter and summer should necessity demand it.

In the daytime the signalman would spend his time in the top of his 50-foot signal mast, where, armed with a pair of double lens binoculars, he would scan the seas in all directions. His orders would be to signal every passing craft, whether sailing ship or steamer, and to enter the questions and replies in the logbook. In the daytime the signaling would all be done by means of the International Code signal flags, displayed at the top of the 50-foot mast. In the nighttime the Shroud light or Meyer code of signals would be used. Ordinary coasting ships would not be reported, but merely entered in the logbook.

Each station is connected by private wire with the Navy Department at Washington. In time of war the operator would report immediately to headquarters of the signal district in which the station was located the signaling of any ship or steamer of importance, and responsible officers there would decide whether it was important enough to send on to Washington. It is believed that the United States thus possesses a perfect signal system, held in readiness at all times for immediate work along our Atlantic coast. In the event of a declaration of war, or a threat of hostilities, word would go forth from the Navy Department over the wires, and within twenty-four hours fifty signal stations would go up from Maine to Texas, and expert, well-drilled Naval Militia volunteers would man them. Within forty-eight hours the Navy Department would be in such a position that every vessel along the coast would be reported to it, and the movement of its own warships up and down the coast could be ascertained. Communication with the warships along the coast, would alone, in such an emergency, prove of the utmost value.

HOW TO STUDY AUTUMN LEAVES.

The government's new Bureau of Plant Industry is taking up the problem of how our gorgeous autumnal foliage receives its variegated coloring. That is one object of the investigations which are now being made by Albert F. Woods, lately appointed pathologist and physiologist of the bureau.

To preserve autumn leaves Mr. Woods says the gatherer should immediately lay them flat between two sheets of new blotting paper spread upon a table top and covered by a stack of heavy books. It is essential that all moisture should be pressed out of them. By this simple process they should be dry within three or four hours. So treated they will retain their beautiful color for years, provided they are not exposed to the direct light of the sun. If not thoroughly deprived of their normally large percentage of water they will soon assume a dirty brown tint.

The color of a leaf, said Mr. Woods, in explaining his investigations, is furnished by minute grains of pigment within its cells. What we see in the fresh leaf is not simple green, but a combination of many pigments, which, when mixed, appear as solid green.

Red is one of the color elements of fresh leaves. Reddish coloring matter is usually in liquid form, within the sap contained by the leaf cells. Yellow, another normal color element, when combined with green, is the natural shade of the grains of pigment within each cell. Brown is the normal color of the walls of the cell.

To explain the leaf cell, Mr. Woods says that he would exhibit a very thin rubber ball filled with the white of an egg mixed with water. He would add to this liquid sufficient red dye to dissolve and color the entire solution. He would add also Paris green, whose minute grains will not dissolve. Yellow grains of some powdered substance, likewise insoluble, he would mingle with the green. The rubber ball itself would be brown, corresponding to the normal color of the leaf cell's walls. Holding the ball up to the light, the combination of the colors in its texture and interior substance would be the green tint of plant life.

To demonstrate the autumnal changes in leaf tints he would spread upon a table hundreds of green beads, interspersed with others of brown, yellow, and red. Then he would take out all of one color, then all of another, and so on, the general shade or tint of the entire mass undergoing a change all the while. Just so in the autumn leaf—when any of its elementary colors disappear the general effect of those remaining clustered in any particular area is altered.

If an autumn leaf turns entirely red this tinting is due to the fact that only its red pigment is left. If it is yellow all of the other coloring has been destroyed, except the minute yellow grains. If the leaf turns brown it can be safely diagnosed as dead. All living tints have disappeared, leaving only the brown walls of the cells. The brown leaf is a dingy ruin, within which every spark of life has been extinguished.

"There has long been a controversy as to the cause of the autumn leaf's coloration," said Mr. Woods. "Some botanists have attributed it to frosts. We are finding that light frosts, not sufficient to kill leaves, greatly facilitate their coloration by causing an increase within them of a normal chemical ferment, which attacks the color compounds or color generators in the cells. We are finding that the oxidation of these color compounds by this ferment causes the various shades of color, especially the purples, oranges, etc. The yellows are normally present in the leaf.

"Autumn leaves containing sugar, such as the maples, sumacs, gums, etc., easily oxidise, and thus form the rich reds, purples and violets so beautiful to the eye. That is why these, especially the hard maples, give the most beautiful autumn leaves. Autumnal oak leaves do not attract admiration because they contain much tannin. The oxidation color of tannic acid is dirty brown. Leaves which die quickly never give autumnal colors."

The most gorgeous autumn leaves, according to Mr. Woods, are produced by a long-drawn-out fall, whose days gradually cool from summer heat to winter snow. But if the frost should come early and the weather should be uneven this fall we need not expect the true autumnal splendors. A heavy, sudden and early frost would kill all leaves alike and turn them to a monotonous brown.

Crimson and scarlet autumn leaves, the most beautiful of all, are more abundant in the cooler parts of this country than elsewhere in the world.

European landscape gardeners are coveting the luxuriance of our autumnal foliage and are endeavoring to transplant cuttings of our most vari-colored trees in their own soil. But thus far those trees which produce the rich purples, crimsons and scarlets have firmly maintained a patriotic determination to beautify only the landscape of their native clime.

The East is much more productive of beautiful autumn tints than is the West, according to botanists. Their explanation for this is that the more humid soil of the East has its beneficial effects.

SCIENCE NOTES.

Dr. Calmette, the director of the Paris Pasteur Institute, was bitten by a cobra from which he was extracting the venom. The serum which he discovered undoubtedly saved his life, but after a lapse of three weeks one of his fingers had to be amputated.

Mrs. Anna Edson Taylor, of Auburn, N. Y., went over the Horseshoe Falls of Niagara in a barrel on the afternoon of October 24 and lived. She was in the water twenty-five minutes from the time the barrel was launched. She was severely injured, receiving a bad scalp wound. The harness rigging in the barrel undoubtedly saved her life.

Dr. N. L. Britton, Director in Chief of the Botanical Garden, has visited the Windward Islands, the object being to obtain living tropical plants and seeds for the conservatory collections. The herbarium specimens for the big museum are as complete a collection as can be obtained. The work is a continuation of the botanical expedition to the West Indies and Central America, instituted in 1899, when Messrs. Heller and Henshaw were sent to Porto Rico by means of funds contributed by Mr. Cornelius Vanderbilt. The museum is obtaining large collections from various sources, and the Torrey Botanical Club has presented its entire herbarium, consisting of several thousand specimens from the immediate vicinity of the city, illustrating the wild plants of the metropolitan district.

The post-office at Buenos Ayres has furnished a striking illustration of the value of X-rays in detective work, says The Electrical Review. Jewelers have found that smuggling in registered letters from Europe was very safe, as the government officials could not legally open such letters on suspicion, and it was finally resolved to investigate the evil without violating the law. The X-rays promptly revealed watches, chains, rings, and other valuables in astonishing quantity. This evidence was sufficient for a court order to open the packages, and more than $20,000 of property has been confiscated in a single week.

STYLE IN AUTOMOBILES.

BY HEROLF WISBY.

There is probably no feature in automobiling of which the public is more ignorant than that which constitutes the question of style in automobiles. It still remains an open question, left to chance and individual preference for a possible sometime solution. Comparatively little is being done by the automobile makers toward guiding the public taste into an appreciation of an actual style; on the contrary, the majority of manufacturing concerns are content to give purchasers the style and finish they desire.

The result is that we are having imposed upon us an array of variegated "styles," conforming to the present popular taste, but they miss the delight and the distinction of a pure style. We are daily happening upon horseless carriages of a "horsey" style for "horsey" people, and we signalize our apparent approval of this silly combination. If among other definitions we may interpret the term "horseless carriage" to denote a vehicle bereft of horses, we have a primitive, but graphic, description of the popular in motor carriages. In point of style, this thing is neither an automobile, properly speaking, nor a vehicle bereft of horses merely, for an automobile is purely a piece of machinery, propelled over the ground by the agency of some self-contained motive power, and the carriage element is a feature permissible only in connection with horses. The best excuse for the existence of the horseless carriage, as such, is found in its proper sphere of utility, namely, the cab, wagon, truck, and omnibus service, in which it may be justly classed a vehicle bereft of horses with a substitute of motors for horse flesh. As an aspirant to automobile touring honors it is, however, an abomination in spite of its present popularity. We may possibly some day arrive at a popularly appreciable definition distinguishing between the horseless carriage as a vehicle substituting motors for horseflesh and the automobile as a motor-propelled machine—a highway locomotive, not a carriage.

Only a single class of automobiles may be said to be progressing toward a definite style, namely, the racing machines. This is quite in keeping with the traditions governing the evolution of machines of locomotion. The racing machines have been to the front for a couple of years. They have shown the way for the touring, the runabout, and the heavy truck vehicles.

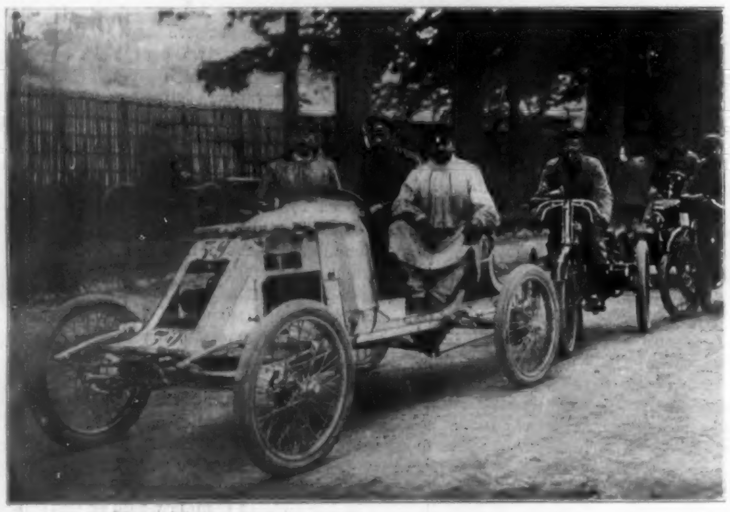


Fig. 1.—M. Beconnais (to the right) in His New Beconnais Flier, with M. Osmont Close Behind on His 8 Horse Power De Dion Motor Tricycle.

Beconnais was fourth in the Paris-Bordeaux race, in 10h. 41m. 25s., and Osmont second in 8h. 3m.

The racing automobile is constantly seeking new improvements, not only in the perfection of motive power and machinery, but in the shape of the model, in the distributing of weight, and in the lines and measurements in which lurk the greatest attainable resistive strength conformable to modern notions of aggressive speed. In order to better illustrate the essential requirements of style in automobiles, in contradistinction to the fancied "style" of horse-people, we will resort to a brief discussion of a few select types, affording a composite picture of the ideas governing actual automobile style:

The rakish-looking craft (Fig. 1) may impress devotees of coaching as a rather forlorn and ugly-looking outfit, but close inspection and some appreciation of mechanical beauty will disclose to us, in this new French pattern, rare evidence of a pure and distinguished style. The body-frame is straight and unbroken, the forward half of the vehicle is taken up by the pretentious condensers and the manipulating devices. There is a twin-seat for the chauffeurs, placed at a sufficient distance from the manipulators to permit of an easy position for the legs, and barely forty inches above the ground, so as to do away with the body-swing of the chauffeurs, and any topheavy tendency in the vehicle, in rounding abrupt curves. Every inch of space in the vehicle has been utilized. No feature has been sacrificed for "style," so called. No fancy curves or decorative embellishments have been added to make the vehicle attractive to preconceived notions of "style." And yet this plain, business-like piece of machinery on wheels has a style of its own, which is not only simple and straightforward but unique. It does not pretend to be a carriage. In fact, its departure from the current horseless carriage design is so radical that it might be mistaken for some stationary motor were the wheels detached. Nevertheless, it represents automobile style so thoroughly that any part of its body frame, if severed from the vehicle, would at once be distinguished as belonging to an automobile and not to a carriage.

It would be hard to find a more decided contrast to this French racer than the English high-power vehicle shown in Fig. 2. If ever the two nations distinguished themselves from each other in mechanical design, this is a typical example. Not only does the British car lack the "body grace" of the French, but every line of its design is hard, angular, and ungainly. The frame is almost as low as that of Fig. 1, but unlike the latter the seat of the chauffeur perches above the condensers, so that the chauffeur finds him-

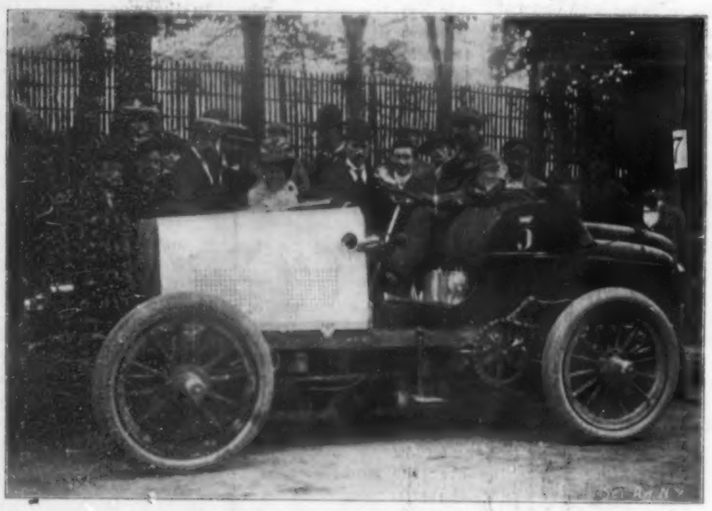


Fig. 2.—Mr. S. F. Edge in His 70 Horse Power Napier Special.

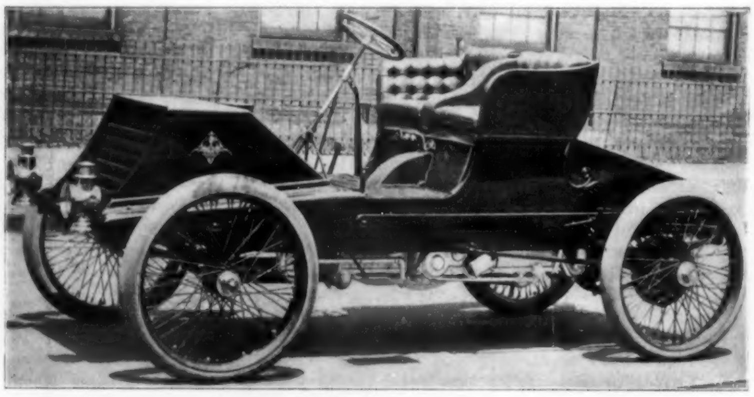


Fig. 4.—A Typical American High Power Racer—Winton 40 Horse Power Machine.

Fig. 3.—Henri Fournier in His Mors Racer.

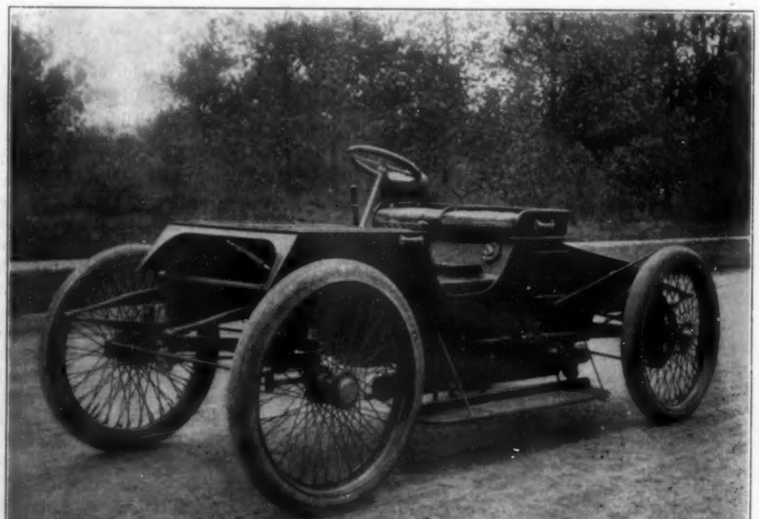


Fig. 5.—The Ford 26 Horse Power Racer.

STYLE IN AUTOMOBILES.

self higher aloft than is good for him when racing. The gearing, though substantially and skillfully made, is crude and unnecessarily bulky. The same may be said of the wheels and the frame body. The stern of this vehicle is nothing but a lumbering adaptation of the carriage idea, without adding a single advantage, and detracting from what would otherwise claim our approval as a genuine, though not entirely satisfactory British model.

The heavy, solid idea in French automobile engineering, furnished with extremely powerful motors capable of record-breaking speed, is probably best illustrated by the Mors model (Fig. 3). This design is a close approach to the locomotive idea, while doing away with the comparatively ungainly features of British vehicles constructed on the same basis. It is a much more ponderous model, but it is not so neat and graceful as Fig. 1. Though it is capable of developing sixty horse-power, and weight for weight is undoubtedly the fastest motor-propelled machine built so far, it is of a type which will hardly prove popular with any but automobile enthusiasts and expert chauffeurs, who view the sport from a professional racing standpoint.

The highest present development in American racing automobiles shows a distinct improvement over even the most graceful French patterns in point of novelty of style. As the French model excels the English in cleverness of design, so the American model has of late acquired a superior, original style of its own, considerably in advance of Gallic ideas. The Winton forty horse-power racer (Fig. 4) is a characteristic example of the progressive spirit of the American designer. Although this vehicle is almost equal to some of the fast French automobiles in speed, it has none of the latter's comparatively clumsy construction. The straight body frame—always the essential base of structural smartness in automobiles—has been preserved; but the unsightly and bulky machinery depending from the bottom of the Mors, has in the Winton been simplified and reduced to less than half its dimensions, and in exceedingly well-protected casings. The ponderous, chariot-like wheels of the Mors are replaced by spindling, but tough, spoke-wheels; the chauffeur seat, comfortably low, is pushed forward so that it overhangs the center of the vehicle, the condensers in front are squeezed into a minimum of space, and the stern slopes away in the smooth, highly-polished finish characteristic of the entire vehicle. It is a pattern which has almost every advantage of the French models (Figs. 1 and 3), besides being a trifle neater and smarter than Fig. 1, and almost as fast as Fig. 3, without the rather unwieldy aspect of that vehicle.

The latest American racing automobile as shown in Fig. 5, the Ford, possesses features entitling it to credit as being the most unconventional, if not the most beautiful, design so far produced by American ingenuity. It is a model that commends itself strc..gly to the automobile experts because of the chaste completeness and compactness of its structure. In this rarified type of racer, the same neat tapering stern will be noticed as in the Winton; the chauffeur seat has been shaved down to a mere "toad-stool" perch, and the forward condensers, instead of being inclosed in a pyramidal casing, have been placed in an inverted shield set at an angle with the air pressure so as to force air up under the pipes—a most ingenious arrangement. No matter how we may choose to view this machine, it is an automobile first and last. The carriage element, so detrimental to a clear-cut, unsophisticated style, has been avoided as in Fig. 1.

Since the discovery of the new magnetic steels we have been enabled to make permanent magnets which keep a constant moment for a whole year within 0.1 per cent. The question as to the best means of storing them when not in use is raised and answered by I. Klemencic. He incloses the magnet in a glass tube filled with cotton wool, which in its turn is embedded in an iron box with sides 3 mm. in thickness. This prevents both disturbances by jarring and by an external magnetic field. He finds that the protection ratio is 3. This is not very high, but it can, of course, be indefinitely increased by increasing the number of boxes.—I. Klemencic, Ann. der Physik, No. 9, 1901.

THE ARTIFICIAL CULTIVATION OF THE RUBBER TREE FOR INDUSTRIAL PURPOSES.

BY ENOS BROWN.

Owing to the extravagant methods employed by natives in harvesting crude rubber, the natural source of supply has been, to a considerable extent, depleted, with the usual results attending similar acts of extravagance and shortsightedness. The injury that has been done to the forests by reckless abuse of the rubber trees has resulted in the possibility of introducing under favorable advantage the artificial cultivation of the rubber tree. A tree of universal growth in equatorial regions, the rubber tree flourishes luxuriantly within the tropics wherever an exuberantly fertile soil, combined with excessive humidity, is to be found. The valley of the Amazon, in South America, and of the Congo, in Africa, would easily supply the world's requirements but for the inaccessibility of these regions and the unreliable, indolent and savage character of their native inhabitants, who only are fitted as gatherers of the rubber harvest, or able to endure the insalubrity of those miasmatic countries where the rubber tree grows.

RUBBER TREE 16 MONTHS OLD—13 FEET 3 INCHES HIGH. MEXICO.

In the Amazon Valley, where the larger portion of the rubber supply of the world is obtained, the risks attending the gathering of the crop are great. Heavy advances must be made to the improvident natives, who depart into the depths of the limitless forests to remain for months, with the chances against their ever returning. The loss is on the factor, whose season's profit must include that which the native gatherer has robbed him of. The result is the enhanced price of the crude rubber.

SAN LUIS NURSERY—SHOWING GROWTH OF YOUNG RUBBER TREES.

The territory where rubber trees grow in the Amazon Valley is constantly decreasing in area. The tree cannot survive the murderous butchery of the native gatherer, whose sole aim is to extract in the quickest manner the gum which is required to pay the advances of the factor, even if the death of the tree is involved.

Every year the native is compelled to travel deeper into the forests in order to reach the living and untouched trees, and the supply is maintained with increased difficulty with each successive season. The valleys of African rivers can be depended upon as a source of rubber supply only when the natives are taught some degree of civilization and submission to their overseers, and after a careful exploration of these regions is made. A century hence Africa may become a tangible entity in the world's rubber supply. Formerly the Central American states and their contiguous Mexican territory exported considerable quantities. There are large areas admirably fitted in physical conditions for the successful growth of the rubber tree, but the native practice of killing the tree in order to get a large present crop has about extirpated the trade. These countries have ceased to be of any account as sources of supply.

Under these circumstances, with supplies becoming every year more precarious, and the demand constantly accelerating, it is not surprising that the attention of investors should have been directed toward projects involving the cultivation and harvesting of a product necessary to the comfort and utilities of the world, and the supply of which is far below actual requirements.

The methods employed in the cultivation of the rubber tree and the harvesting of the crude rubber are shown in the accompanying views, for which we are indebted to the Chiapas Rubber Plantation and Investment Company, of San Francisco, Cal., which has acquired from the Mexican government some 25,000 acres of land, situated in the Valley of the Rio Michol, State of Chiapas. This tract of land was selected because the soil, temperature and rainfall are particularly favorable to the rapid growth of the rubber tree.

The temperature of this section seldom rises above 93 deg. or falls below 60 deg. The rainfall is from 100 to 150 inches annually, and is pretty regularly distributed, though the first four months are less in amount than the last eight. The soil is the deposit of ages of decayed tropical vegetation. The *Elastica castilloa*, from which the Aztecs procured their supply of rubber, is here indigenous. Mahogany and many other woods useful in the arts flourish.

There is no plant of equal value that responds so quickly to careful cultivation as the rubber tree. In lands adapted to its growth, once started, the tree requires but little care. It continues to yield for decades, provided it is not killed by violence. To prepare a plantation requires only the clearing of undergrowth and its destruction or removal. The forest trees are undisturbed so as to afford the partial shade that the growing rubber tree craves. The young trees, just from the nursery, are planted 14 feet apart, or 200 to the acre. The planting season lasts from May to January, during the months of heaviest rainfall. The trees are grown from seed, procured on the spot, which rarely fails to sprout.

The problem of a regular and efficient labor supply—one of the most serious questions affecting the industry—has been happily solved. The natives are naturally indolent, and, at first, suspicious of foreign interlopers; but, with better acquaintance, their confidence is gained and distrust vanishes. The jingle of the silver dollars is very fascinating to the untutored Indian and is a great persuader to industry. No difficulty is found in securing all the labor required. In clearing the lands and planting trees the native Mexican is very apt, and the climate is so humid and enervating that only a native could endure it.

Dr. Helm, of Dantzig, has analyzed several samples of bronze found in the explorations at Nussar, or the ancient Babylonian city of Nippur. He ascertained that the ancient founders employed, in making bronze, not only tin, but antimony as well. The proportion of antimony is larger in the oldest examples. Copper is supposed to have been found in northwest Arabia. Two heads of almost full-sized gazelles which were found by Prof. Hilprecht show wonderful skill in the use of metals. An analysis showed the existence of nickel in the copper.

BUILDING THE NEW BEACHY HEAD LIGHTHOUSE.

BY HAROLD J. SHEPSTONE, LONDON, ENGLAND.

The new lighthouse which the Corporation of Trinity House are erecting off Beachy Head, on the English south coast, is an interesting piece of work on account of the scientific manner in which it is being carried out. The lighthouse is being erected in the sea, some 550 feet from the base of tall cliffs. There is a lighthouse on the famous promontory, but owing to the encroachments of the sea at this particular spot, and the additional fact that the light from the present lighthouse, some 400 feet above the level of the sea, is frequently capped by fog, the Corporation decided, as far back as 1899, to abandon the present station and erect another structure in lieu of it on the foreshore beneath the famous cliffs.

The coast was thoroughly surveyed and at last a site was chosen. Curiously enough, a large steamer was wrecked not many months ago on the very spot selected and became a total wreck. The site is some 550 feet from the toe of the cliffs and at high tide is covered to a considerable depth. This makes the work doubly interesting, for there is a wonderful difference between erecting a structure on a wave-washed rock and on land.

First of all a temporary staging was erected close to the selected site and this, in turn, was connected with a workyard at the top of the cliff by a wire cableway, which was built from designs prepared by Mr. Thomas Matthews, chief engineer to the Corporation of Trinity House, and Mr. W. T. H. Carrington, engineer to Messrs. Bullivant & Co., who supplied the necessary material for the erection of the cableway. The ropeway is constructed on Bullivant's system No. 5, in which the descending load draws the ascending load up, a system which can easily be carried out when there is a gradient of at least one in fifteen. In the case of the line under notice the arrangement was necessarily modified in order to provide for bringing up workmen when no materials are ready to send down. Steam power is then resorted to, connected in such a way that the brake gear can be moved around by it.

Our illustrations convey a good idea of the ropeway and what it is capable of accomplishing. There are two fixed ropes, stretched parallel between the two points, 860 feet apart. One has a circumference of 6 inches and the other 5½ inches. The former has a breaking strain of 120 tons, and the latter 100 tons. These ropes terminate at a massive wooden trestle erected in the workyard on the cliff tops, carrying tension bars fitted with thimbles suitably supported in brackets on its summit, to the outer thimbles to which the ropes are attached. The strain is transmitted through tension bars to tiebacks in the rear of the structure, so that the fixed ropes, at the point where the strain is most severe, are not subject to any bending action.

MASONRY OF THE BASE AND LANDING OF BEACHY HEAD LIGHTHOUSE.

The ropeway is carried back some little distance to the rear of the structure and anchored in the hard chalk in the sea bottom. It was found that the staging was not strong enough to take the necessary strain. The tightening is accomplished by an arrangement of two screws combined, so that when the tightening is effected by one screw the other acts as a fulcrum and reduces by one-half the strain necessary to apply on the screw for tightening purposes. This tightening gear with a drift of about 8 feet is carried on a strong wooden frame placed on the staging, and advantage is also taken of this frame to carry suitable lead-on pulleys and a turn-round wheel, round which the return hauling rope passes.

This unique aerial ropeway has now been working efficiently for some twelve months. It is used every day, and during the early stages of the work often at night. Some heavy pieces of machinery, such as pumps, a steam engine, crane, etc., as well as large quantities of cement, shingle, etc., have been safely sent down to the temporary landing stage. The stones, the heaviest loads, always descend on the 6-inch rope, and on the parallel rope a balance load is run which the stones descending draw up, thus considerably reducing the necessary brake power. This arrangement is necessary only in the transport of the stones and very heavy loads; for the transport of lighter loads, each rope is used indiscriminately.

The brake gear consists of two 8-foot diameter wood grooved wheels, each fitted with a brake sheave. As it is desirable that the brakes shall be worked by a man who has a full view of the movement of the carriers, chain wheels are fitted to the screw spindles which operate the brakes, and other chain wheels with hand wheels are fitted to the trestle frame, communication between the two being effected by a chain which is provided with tightening gear. The hand wheels are placed close to one another, so that when the brakeman is operating the ropeway with one brake he has another immediately in reserve should anything fail. The hauling rope, passing round the upper brake wheels, returns and passes round a tension wheel 8 feet in diameter, then again returns to the brake gear, passes round the lower brake wheel, and in its turn is led to the head wheel and down to the carrier, to which it is connected. A portable railway has been erected to bring the stones from the depot to the cableway, and a moving platform has been devised to assist in the operation. As soon as the blocks of granite are shackled to the carrier, the moving platform with its truck descends into a pit to allow the stone to pass down without touching it.

The lighthouse site is a little to the left of the base of the temporary staging, and the first thing the authorities did was to erect a dam around the foundation, in order that work could go on for a considerable time after the tide had commenced to rise. The moment the water begins to overflow the dam the men take shelter on the temporary staging. They can resume work long before the tide has receded from the surrounding shore, by pumping out the water. All tools and movable machinery are, of course, transferred to the landing stage the moment the water commences to flood the dam. It is interesting to note that the foundations of the new lighthouse are laid at a depth of 10 feet under low water in hard chalk, which is entirely different in character to the friable chalk of the cliff. A comparison with charts fifty years ago shows scarcely any difference in the formation of the shore.

As previously stated, the new lighthouse will be of the same kind of granite that was used in the construction of the present Eddystone Lighthouse, and also in such notable structures as the Tower Bridge, Blackfriars Bridge and the Thames Embankment. Before the granite is dispatched to Beachy Head it is not only cut to size, but built up in sections to see that the blocks fit into one another. This is the course generally adopted in the erection of all lighthouses in the sea. The course is what is termed dry-fixed on a platform specially prepared for it. In the present case it is built up in sections at the quarries and inspected before it is sent on to Beachy Head. The top course is then refixed on the platform and courses built upon it, this process continuing until the whole of the lighthouse has been temporarily erected on shore.

To the top of the masonry the new lighthouse will measure 123½ feet, and to the top of the lantern 153 feet. Altogether there will be seventy-six courses. Up to the twenty-sixth course the stones have a depth of 1 foot 10 inches, while after that they are only 1 foot 6 inches deep. The whole of the stones are dovetailed wherever they meet, and these joints are filled in with cement, thus making the tower as firm as if it were in one solid piece. The same unique system of dovetailing is being carried out as was resorted to in the erection of the present Eddystone Lighthouse. Before the stones are dispatched to Beachy Head they are numbered—say 13/5, which means that it is the thirteenth block in course No. 5 from the bottom. The system of erection and numbering is shown in the accompanying cut. Altogether 50,000 cubic feet of granite will be required for the new lighthouse, and 1,300 cubic yards of concrete hearting will be required to fill the center of the lower courses.

At its base the tower will have a diameter of about 47 feet and will be solid for about 48 feet, with the exception of a space required for the storage of water. Where let into the chalk the tower is cylindrical in form and continues so for a height of 9 feet 2 inches. Above this level it is a concave elliptic frustum, the generating curve of which has a semi-transverse axis of 158 feet and semi-conjugate axis of 44 feet. Outside of a portion of courses 5 to 19 is fixed the ashlar which forms the landing. There are nineteen of these courses with sixteen steps up to the top. This will be all filled in with concrete and paved with granite sets with a strong granite curb fixed all round the top.

Above the solid portion are the necessary rooms, eight in number. They commence at course No. 26, the entrance room. Then come the oil-room, crane-room, store-room, living-room, bed-rooms, and service-room. The four upper ones are 14 feet in diameter. The living-room will be fitted up with every convenience for the men, while they will also be able to pump up water to the tank in the living-room.

A dioptric apparatus will be installed in the lantern, giving flashes of about 83,000 candles' intensity. Steamers will easily recognize the light by its two white flashes every fifteen seconds. The beam of light will be visible for seventeen miles out at sea, which is the average distance to which the lights of all British lighthouses now penetrate. The clock to regulate the flash is wound by hand, the weight rising and falling in a tube in the center of the lighthouse. The apparatus will rotate in a mercury trough of the usual modern pattern.

At the time of writing this article the work has reached what is known as course No. 20. It is being rapidly pushed forward, although it is doubtful if the station will be finished before next season. Considering the nature of the undertaking, the work has gone on very smoothly, principally no doubt through the scientific manner in which the builders went about their task. When completed the Beachy Head lighthouse will be one of the finest on the English coast.

Scent.

It should be remembered that the basis of all perfumes is an essential oil of some kind, derived either naturally from flowers or leaves or artificially by a synthetic process, says The Lancet. In either case the essential oil is a powerful antiseptic and possesses disinfecting properties not less in degree than those of carbolic acid itself. As is well known, the essential oils absorb atmospheric oxygen, forming an unstable compound easily lending oxygen for the work of purification. Pine oil, eucalyptus oil, and turpentine act readily in this manner—a fact which probably accounts for the salubrity of the air of pine forests and eucalyptus woods. The use of scent by many women is excessive, and by men is looked upon as effeminate—a prejudice that we confess to sharing—and yet the question naturally arises: As we study our environment to please the eye by color and natural effects and to please the ear by musical notes, why should we not make similar endeavor to please the nose by agreeable and fragrant odors? Each sense may suffer offense and there is no reason why each sense should not be equally defended in this regard. And the use of scent on the pocket-handkerchief, which is where we commonly find it, is calculated to exercise a higher office than merely to please the sense of smell. The handkerchief may easily prove a source of infection, for it is made to be the common receptacle of secretions from the nose and mouth, and the employment of an antiseptic handkerchief is perfectly consistent with the dictates of common bacteriological evidences. The liberal use of scent on the handkerchief is calculated to make it antiseptic and to destroy the germs in it, owing to the action partly of the spirit of the scent and partly of the essential oils dissolved in the spirit. Before, therefore, we condemn the persons who use scent upon the handkerchief for practising a foppish or luxurious habit we should remember that they may actually be doing good to their neighbors by checking the distribution of infectious materials.

There is a large and increasing consumption of mica in the United States. Clear sheets 4 by 4 inches in size and upward must be provided for the mica to be worth a good price.

Automobile News.

The Peugeot automobile which has lately been put into service in Tunisia for passenger transportation has made a good record on its trial trip. The route lies along the coast from Sfax to Sousse, passing by the towns of El Djem, Ksoursef and Mehdia, and presents considerable difficulties in some parts, especially between El Djem and Ksoursef, where it is nothing more than a camel track. The automobile, however, has been able to cover the whole route in a relatively short time. For instance, from Mehdia to Sousse, or 48 miles, it took only 2 hours 40 minutes, and besides, the trip was made on a dark night with but insufficient lighting. On the return trip it covered the distance from Sousse to Sfax, by a different road, or 78 miles, in 6 hours 50 minutes. On these trials the total distance of 180 miles was accomplished without the least accident.

We have received a communication from a subscriber in Peru, A. Wertheman, relative to his automobile. Mr. Wertheman is the superintendent of the Tarica Mining and Smelting establishment, which is located 11,466 feet above the sea, and the mines are 14,714 feet above sea level. A rather good cart road connects Tarica with the mines. Last year Mr. Wertheman visited the Paris Exposition and had a steam automobile of 5 horse power built by Serpollet. The machine had to be brought into Tarica in pieces on the backs of donkeys. The roads were very difficult, and only 60 pounds could be loaded on the back of any one animal. The machine was finally put together and does perfect service, running three times a week between the mines and Tarica, a distance of 13 miles. Part of the road has a 10 and 12 per cent grade. At first there was some trouble experienced with the burners because of the elevation of the mine, at which the water boils at 85 deg. C., as the atmospheric pressure is a third less than it is at the level of the sea. It is interesting to know that this is the only automobile in Peru, and the only one in the world that travels at such a height.

The recent accident to the celebrated French chauffeur, Fournier, and a party of friends during a run in his automobile on Long Island, when the vehicle was struck by a locomotive, brings once more before the public the unguarded condition of the railroad crossings of the Long Island Railroad. In this particular case there was no signalman, no gate, nothing indeed beyond an electric bell to give warning that a locomotive was approaching. M. Fournier states that he was quite unable to hear the bell, the sound of which was entirely drowned by the noise of his own vehicle. This statement will be readily believed by the owners of gas-propelled automobiles of the type used by Fournier. It is well understood that when the clutch is thrown off, as in approaching a crossing, the impulses of the engine shake the whole car, and there is more noise than when the impulses are absorbed in driving the vehicle. The erection of an electric gong at railway crossings may be a very cheap and convenient method of protection from the Long Island Railroad point of view, but it is extremely perilous to the traveling, and especially to the automobiling, public.

The Building Edition for November.

It seems as though each successive issue of this unique periodical contains more beautiful examples of houses and grounds than the preceding issue. The cover and two entire pages in the inside of the paper are devoted to the extensive grounds of the residence of E. C. Benedict, Esq., at Greenwich, Conn. There are a number of low-priced houses in this issue, also two stables and a page of modern colonial stairways. The tenth in the series of "Talks with Architects" is with F. R. Comstock: "Some Suggestions for Moderate Priced Houses." The editorial is devoted to the "Suburbs in Winter." The "Monthly Comment" is very interesting, and the second of the technical articles on "Heating the House" is devoted to "Warm Air Furnaces."

The Current Supplement.

The current SUPPLEMENT, No. 1349, has a number of articles of unusual interest. "Some Celebrated Long-Span Stone Arch Bridges" illustrates three of the most beautiful achievements in the whole range of civil engineering. "Enameling" is the first installment of a series of articles on this subject. "General Specifications for a Gasoline Motor Car" is by H. Ward Leonard. "Petroleum from the Beaumont, Texas, Field," is by Clifford Richardson and E. C. Wallace. "The Roze 'Aviator'" illustrates one of the most ambitious designs ever put into operation. It is accompanied by a number of engravings. "Anthropology" is one of the British Association addresses, and is by Prof. D. J. Cunningham, M.D. "Sorghum Sirup Manufacture" is by A. A. Denton, and is well illustrated.

Engineering Notes.

For the navy yard at Charlestown, Mass., a very large anchor has just been made; it is 16 feet long.

The Pennsylvania Railroad is to enlarge its Brooklyn annex ferry, and the improvements include two large piers for the use of ocean steamers, which are controlled by the railroad interests. The piers will be two stories high and 700 feet long.

The British War Office is experimenting with a new field gun invented by Sir George Clark. It is a light weapon and is to be attached to the British Field Artillery. The most salient characteristic of this new arm is the long trail with which it is provided, and the under portion of which forms a storage, thus dispensing with the use of a limber.

Very high steam pressures are used on some English launch engines. One shown at the Glasgow Exhibition works under 375 pounds per square inch, and, as a consequence, together with high rotative speed, gives great power in a small space—140 horse power at 1,200 revolutions per minute. This engine is of the four-crank, quadruple-stage expansion type, and has cylinders 3¾ inches for the high pressure, 5 inches, 7½ and 11 inches for the other cylinders. There is a feed pump attached, which is driven by a worm on the main shaft.

The port of Berehaven, at the southwestern corner of Ireland, which it is intended to convert into a terminus for a transatlantic fleet of liners, is now brought within the same stringent regulations that prevail at all the other dockyard ports of Great Britain, and the whole anchorage within certain limits is reserved for defense purposes. This port is to be rendered a first-class naval base, and will be the headquarters of the Channel Squadron. The waters are to be deepened at certain points, and heavy artillery is to be installed to adequately protect them in case of emergency.

The Russian and French navies, satisfied with the utility of the balloon for military purposes, have established a similar aeronautical section for service with the navy. The balloons are held captive in the ordinary manner, and are connected by telephone with the battleship below. A balloon section has been attached to the Mediterranean squadron of the French navy for some time past, and has been employed for scouting purposes with conspicuous success. The Russian experiments are to be carried out in the Caspian Sea, and if the balloon establishes its utility for naval scouting, a balloon is to be provided with each ship.

It has become the fashion to sneer at submarine vessels in some quarters, but English technical journals do not indulge in the practice, for they see in the growing fleet of French submarine vessels a distinct menace to English commerce. There are twenty-nine submarine boats now, of the electric type, in France, and five of other kinds, and they are constantly increasing in numbers. Engineering says that if 100 of these vessels were let loose at night in the Channel, they would be capable of establishing themselves in favorable positions before daylight and do incalculable damage to British commerce; it thinks that the submarine boat has increased the dangers from torpedoes tenfold.

The new armored French cruiser "Léon Gambetta," which has been constructed at the Brest dockyard, will shortly be launched. She is the largest vessel in the French navy. Her length between perpendiculars is 450 feet; beam, 65 feet, and displacement, 12,550 tons. She is to be fitted with tubular boilers, and three triple expansion engines of the vertical type, driving triple screws, and developing 27,500 horse power, capable of producing a speed of 22 knots. She will carry four heavy guns in pairs, mounted in turrets, fore and aft, forty quick-firing guns of various calibers, and five torpedo tubes, two of which will be under water. Her officers and crew will number 730 men. The cruiser will not be commissioned until 1903, and by that time over $6,000,000 will have been expended upon her.

It was supposed that the new yacht for the King of England was in first-rate condition when she left the dockyard at Portsmouth recently and that all the defects and troubles that had arisen from time to time had been successfully surmounted. Such, however, is not the case, and it appears that her usefulness is as remote as ever. She sailed on a trial trip to Gibraltar and back, and she displayed considerable unsteadiness. She rolled very heavily in the slightest beam sea, and occasionally the list was very dangerous. To overcome these defects it is stated that extensive alterations are necessary, but are almost impossible to carry out owing to her structural arrangements. At least an increased draught of four feet is required, but as her lower portholes are now only a few feet above the water-line, this requirement can only be fulfilled by removing the port-holes, thus depriving the lower apartments of natural light. It has been stated by experts that the cheapest means of solving the difficulty is to construct a new yacht. At any rate, she will have to be almost entirely reconstructed.

Electrical Notes.

A new system of recutting files by electricity is being established near London.

A 30-ton armature which fell into the Sheffield Canal has had to be rebuilt and reinsulated.

The Pennsylvania Railroad is to experiment with the Delany telegraph system, by which it is possible to transmit 8,000 words a minute, while a commercial rate of 2,000 words a minute off a single copper wire is said to be possible. Perforated tape is used, and the characters are recorded electrolytically on chemically-prepared tape.

A method of supporting osmium filaments has been devised by Mr. O. Imray, of London. These filaments, as is well known, are heavy in proportion to their strength, even when cold, while when heated they become very soft. To remedy this disadvantage, appropriately shaped bodies of refractory oxide chemically inert in reference to osmium are employed. These supports are made of thoria and magnesia, mixed into a paste, in the proportion of ten parts of the former to one of the latter, with a suitable organic binding material. They are then molded to the requisite shape, burned in air until the organic matter has been wholly consumed, and afterward fritted or sintered together.

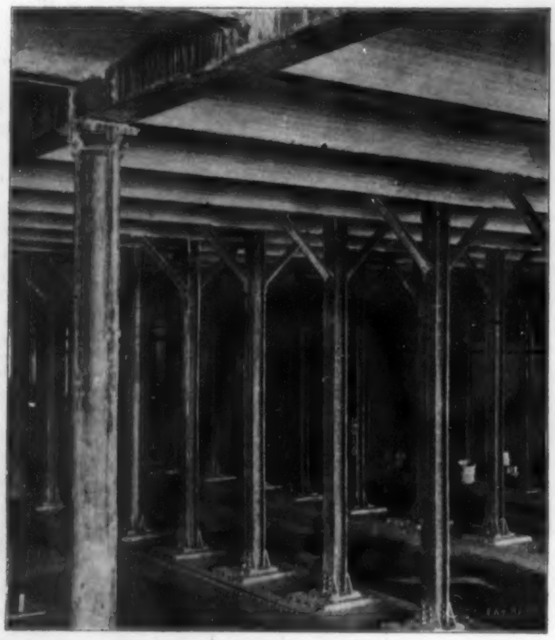
A system of wireless telegraphy, the messages of which it is stated cannot be tapped, or received by any instrument other than that for which they are destined, has been invented by a London electrical engineer, Mr. Johnson. Each transmitter in this system has differently tuned reeds, and when it is desired to send a message, the tune of the receiver to receive the same must first of all be ascertained, and the transmitter must be adjusted accordingly. Each receiver has a different tune, thus rendering it absolutely impossible for messages to be tapped. The Admiralty has examined the system, and are so impressed with its advantages that three battleships are being fitted with it for the purpose of carrying out experiments.

A process of rendering the Nernst incandescent lamp more durable has been devised. By this means the temperature of the light-emitting conductor is raised to a degree higher than is attained in actual use. To accomplish this heating it is essential that the conductors should be passed across and through an arc, produced between two carbons separated by a distance of ⅝ inch. One peculiarity of the Nernst conductor is that if made cylindrical it rapidly becomes tubular, owing to the more intense heat developed in the interior of the conductor. It is desired that the shape should be other than tubular, and to accomplish this purpose various cross sections are utilized in which the surface is extended and the thickness of the material reduced.

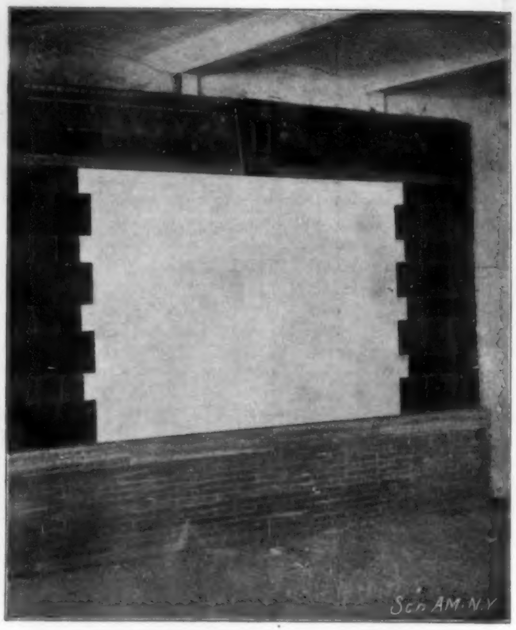
In Italy the Lecco-Sondrio and Colico-Chiavenna lines will be entirely propelled by electricity, the latter line, about 70 miles long, being capable of carrying freight trains of over 250 tons. On the Milan-Porto-ceresio line of 63 miles, electric traction will be employed for passenger traffic, at a speed of 54 miles per hour, says The Railway Review. In France a commission has been appointed for investigating the problems connected with electric railway traction. It is hoped to be able to make much use of water power for generating purposes, the Riviera district especially offering natural facilities for this method of driving. In Austria and Norway similar projects are being prepared. A syndicate of Russian bankers proposes to connect St. Petersburg and Moscow with trains running at 93 miles per hour, at 10 minutes' intervals, from each end, each train consisting of five 35-passenger cars.

Mr. Peter Cooper Hewitt has recently had ten patents issued to him on his vapor lamp, which attracted such widespread attention at the Conversazione at the spring meeting of the American Institute of Electrical Engineers. The patents give most valuable information concerning the principles which underlie the construction of these lamps and disclose the fact that Mr. Hewitt has discovered some entirely new principles in electric illumination. Means for starting the lamp, for automatic regulation and the control of the character of the light emitted are all covered by these patents. Mr. Hewitt found that by introducing into the tube a small quantity of mercury sulphate or some sulphur compound, and by the use of a certain device in proximity to one or both electrodes, the starting device can be reduced to a simple form of induction coil or similar apparatus that will give a momentary increase of voltage at the time of starting, and then permit of being switched out of circuit automatically. Several types of such arrangements are described in one of his patents. Mr. Hewitt also finds that by suitably proportioning the length and diameter of the tube, and the thickness of the glass, the lamp can be made self-regulating. He has also found that nitrogen combined with mercury vapor gives excellent results as regards the quality of the light.

Entrance to Tunnel, Central Park.

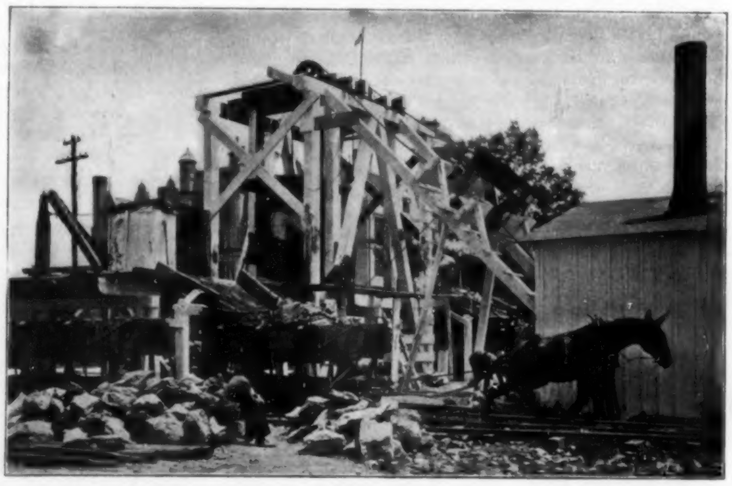


Fifty-ninth Street Station.

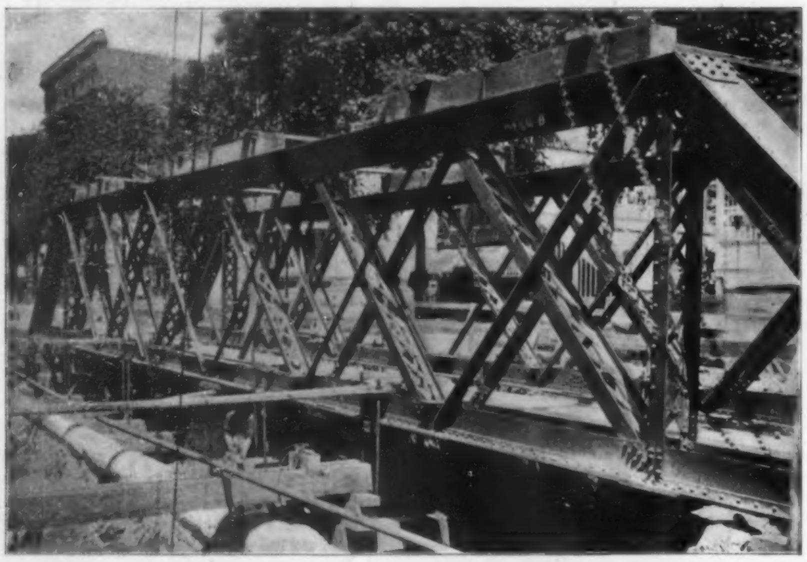


Experimental Tiling at 59th Street Station.

Bowstring Truss Carrying Surface Tracks at 92d Street.



Hoisting Gear at Top of Tunnel Shaft, 168th Street.



Method of Carrying Surface Tracks During Excavation.

Tunnel at 157th Street, Showing Concrete Arch Construction.

Open Rock Cut, Union Square, Showing Steel Work in Place, Before Concreting.

View at Houston and Elm Streets, Showing Brick and Concrete Covering Being Laid Over Steel Work.

SOME METHODS OF CONSTRUCTION OF RAPID TRANSIT SUBWAY.

SOME METHODS OF CONSTRUCTION OF THE RAPID TRANSIT SUBWAY.

In our last issue we showed by diagram and description what remarkable progress was being made in the construction of the Rapid Transit Subway, and we now supplement that article with a series of views, taken at various points along the route of the work, which illustrate the methods by which the construction is being carried on, and serve to show, incidentally, how fully completed certain portions of the work are at the present writing. Commencing at the northern extremity of the line, the first important piece of construction is found at 181st Street and 168th Street and Broadway, at each of which places a shaft has been sunk and tunnel excavation has been carried on north and south under Broadway for a distance of about an eighth of a mile. One of our illustrations shows the head works above the shaft at 168th Street. Two hoisting cables are used, an empty truck being lowered while the loaded truck is being hoisted to the surface. In the tunnel the rock as it is blasted away is loaded onto trucks which are hauled to the foot of the shaft, run onto the hoisting cages, and brought up to the unloading platform shown in our illustration. Here the load is dumped into trucks, in which it is hauled by mule power down one of the cross streets, leading to the bluffs of the Hudson River, where the material is being used for making new ground. At each of the places mentioned a pair of elevators and a stairway will carry passengers to the level of the Subway tracks, and separate passageways will lead at two different levels to the north-bound and south-bound trains. The next point of interest illustrated is the entrance to the tunnel at 157th Street and Broadway. The view shows clearly the concrete arched lining of the tunnel with its back-filling of rock. Although there are long stretches of tunnel excavation where the rock would probably be sufficiently solid to prevent any cave-in, no risk will be taken, and the whole interior of that portion of the tunnel which is being excavated too deep below the surface of the ground for open-cut work will be lined and finished off with a concrete arch. At 157th Street, owing to a natural depression in the ground, the tunnel reaches the surface, and here a station will be built.

Another important stretch of tunnel excavation occurs beneath the northwestern corner of Central Park between 104th Street and Central Park West and Lenox Avenue. A shaft has been sunk to grade at the former point and the tunnel is being driven in both directions. We present an illustration taken at the intersection of 110th Street and Lenox Avenue looking toward the point of exit of the tunnel from the face of the high ground at the northwest corner of the Park. Here a deep cutting, several hundred feet in length, has been made into the face of the cliff, the poor nature of the rock rendering it necessary to make a long open cut before the heading could be driven. The view shows the heading and also the commencement of the concrete arch, which extends at this point beneath the northerly driveway of the Park. It should be explained here that not merely will the tunnel excavation be lined with concrete arches, but at several other points, such as the one last mentioned, and the loop beneath the City Hall Park, the same concrete arch finish will be used.

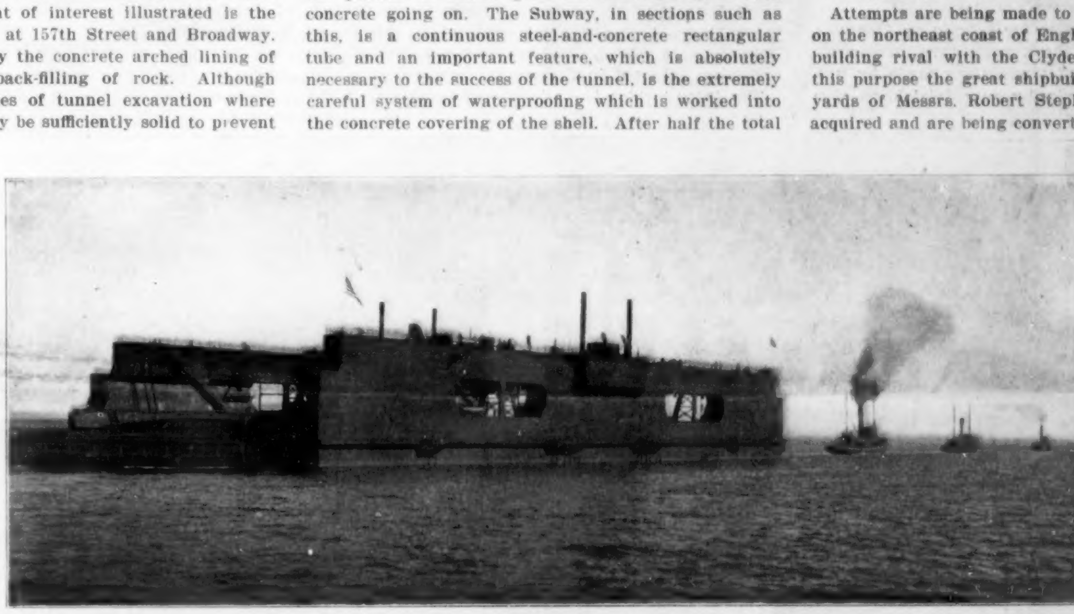
The bulk of the Subway, as our readers are well aware, is being built by open excavation, and several of our views show the method adopted in carrying temporarily the heavy double tracks of the Metropolitan Street Railway Company's lines, upon which traffic has to be maintained without interruption. In order to support these tracks until after the underpinning can be placed beneath them, the contractors make use of a pair of steel or wooden trusses, or deep I-beams, one on each side of the tracks, these trusses being of sufficient length to cover a stretch of from 30 to 40 feet. The ends of the two trusses are given a firm footing on the natural soil, and transverse trenches are then cut beneath each of the cast-iron yokes that support the trolley tracks. Into these trenches are inserted 12 by 12 timbers, which are hung from the bottom chords of the trusses by stirrups of 1-inch wrought-iron. The excavation is then completed, leaving the track entirely supported by the trusses. As soon as the excavation is down to grade 12 by 12 posts are placed beneath the transverse sills, leaving the trusses free to be moved forward from 40 to 50 feet, as the case may be, and the operation repeated.

After the excavation has been carried down to subgrade the square blocks of stone which form the footing for the columns that support the roof are put in place, the steel columns are erected, the overhead and sidewall girders put in place, and the whole riveted together. The bents thus formed are spaced 5 feet apart and extend continuously throughout every part of the tunnel that is not finished with a concrete arch, as above described. One of our views, taken in the interior of the station at 59th Street and Broadway, gives an excellent idea of the appearance of these columns. They perform the important work, not merely of supporting the roof, but of carrying the extremely heavy loads of the street traffic overhead. They and the girders which span them have been made sufficiently heavy to stand the concentrated loads which result from the passage of traction engines, or of trucks loaded with structural iron or heavy cables. After the steel work is all riveted up the spaces between the I-beams at the side walls and in the roof are filled in with concrete which is rounded off with a smooth finish. One of the accompanying illustrations, which was taken looking north on Elm Street from Houston to Bleecker, shows a portion of the four-track Subway with the steel in place, and the process of finishing in the roof and sides with concrete going on. The Subway, in sections such as this, is a continuous steel-and-concrete rectangular tube and an important feature, which is absolutely necessary to the success of the tunnel, is the extremely careful system of waterproofing which is worked into the concrete covering of the shell. After half the total thickness of concrete has been put in place, six layers of tar and felt are applied, both in the floor, the walls and the roof, thus shutting in the whole Subway with an absolutely impermeable sheathing.

Between the stations the interior surface of the Subway will be left as finished by the steel men and the concreters, but at the stations themselves the surface will be lined with enameled tiling; and experiments are now being carried out at the 59th Street station with various colors and patterns of tiling to determine which will be the most suitable. The accompanying illustration shows a section of the wall finish of the station which has been put up to test its qualities and judge of its effect. The center panel is pure white and the trim and frieze are dark green.

One of the most important stretches of rock excavation by open cut is that which is being made along the eastern side of Union Square, from 14th to 17th Street. To facilitate blasting operations the Metropolitan Street Railway tracks were diverted, a new line being built close against the eastern curb of the street. The rock has been taken out pretty well back to the eastern line throughout most of the three blocks, and the floor over the greater portion of it has been concreted, the foundations of the columns laid, and the steel work erected. A photograph taken at this point shows with great clearness the whole construction. It will be noted that after the footings of the columns are in place the concreting is carried up flush with the top surface of the footings. Not far from the massive steel work shown will be located the 14th Street station, one of the most important stations.

The Russian Imperial Geographical Society has received news from the Kozloff expedition, sent out to explore the headwaters of the Hoang River, that this expedition has obtained valuable collections which are now under the military guard.



Length, 525 feet; breadth, 126 feet 2½ inches; depth, 51 feet 9½ inches.

TOWING THE NEW UNITED STATES FLOATING DOCK TO ALGIERS, LA.

TOWING THE NEW NAVAL DRYDOCK TO ALGIERS, LA.

The floating steel drydock intended for the naval station at Algiers, La., which has already been described in the SCIENTIFIC AMERICAN, was towed from the works of the Maryland Steel Company at Sparrows Point to Algiers by the steamer "Orion," one of the largest towboats on the Atlantic coast, assisted by the steamer "Taurus." The route down Chesapeake Bay around Cape Hatteras and the Florida peninsula, thence through the Gulf of Mexico and up the Mississippi River, comprised about 1,800 miles. As the dock weighed nearly 7,000 tons, and when in its ordinary position opposed a surface nearly 50 feet high to the wind and seas, the task of bringing it safely to its destination was one of unusual magnitude. In carrying out the work two 5-inch hawsers twisted together were used as the towing cable, the dock end being connected to the anchor chains of the dock, forming a bridle. On the towing craft the cable was connected to a steam towing machine which automatically kept the line taut, reeling it in when necessary and running it out to relieve any strain caused by current or waves. The auxiliary wedge-shaped ends were used in front and back of the dock principally to steady the great bulk, and keep it as much as possible from drifting broadside to the sea. The average speed ranged between four and six knots an hour. The illustration shows the dock just after starting, with a third steamer to assist in taking it through the channel at the entrance to Baltimore Harbor.

A Rival of the Clyde and the Thames.

Attempts are being made to convert the River Tyne, on the northeast coast of England, into a serious shipbuilding rival with the Clyde and the Thames. For this purpose the great shipbuilding and boiler-making yards of Messrs. Robert Stephenson & Co. have been acquired and are being converted into a huge dockyard. An immense graving dock 700 feet in length sufficiently large to accommodate the largest battleship afloat, is in course of construction. Four machine sheds, each 285 feet by 75 feet, have been built, and are being equipped with the latest and most up-to-date ship-building, boiler-making, and bending machinery. An American plate-stacking electric crane with arms each 142 feet in length has been erected. Four berths are also being prepared on which vessels 700 feet in length can be built, while four additional berths capable of accommodating vessels varying from 350 to 500 feet are to be constructed. The river at the end of these launching ways is to be considerably deepened to facilitate launching. The object of these elaborate reconstruction works is to enable the largest types of ocean-going steamers to be built, and also to provide extra facilities for the construction of battleships for the Admiralty, extensive orders for which are expected to be given out in the near future. There is remarkable activity in all the shipbuilding yards of Great Britain at the present moment, several of the leading ocean steamship companies having placed large orders for additional vessels.

600-Foot Waterfall in Hawaii.

The Bishop Museum has an exploring party in the field surveying and measuring the rainfall and water supply of the Honolulu region, in order to determine whether it is practicable to store water in the mountains and carry it to sugar plantations in flumes. The endowment of the museum includes lands in Kohala and Hamakua, on the Island of Hawaii, in which are Waipio and other gulches that extend from the sea to the highest points of the Kethala Mountains. The party has made a number of important geographical discoveries. The source of Waipio River has been found to be several miles further up the mountain than was supposed and in a waterfall that has one sheer fall of 600 feet, and in this exceptionally dry season runs 8,000,000 gallons per day. The party reached this waterfall only because of the low water, which permitted the explorers to ascend the bed of the stream. The forest growth was nearly impenetrable and the trail had to be cut through the tropical jungles. They were probably the first white men to see this magnificent waterfall.

Patent Department

UNITED STATES AND GERMAN PATENT PRACTICE.

Our Consul-General at Berlin, Mr. Frank H. Mason, has handed in a report in which a shrewd comparison is drawn between the practice followed in the German and United States patent offices, and in which are contained many suggestions of considerable value to inventors.

Mr. Mason shows in the introductory portion of his report how incorrect is the supposition that the German patent examiners are hostile to foreign inventors, and that every inventor is considered a plagiarist until he has proved the contrary. "In many, if not the majority, of the cases," says Mr. Mason, "the troubles of American inventors in the German Patent Office are due to their failure to realize the difference in the two systems of application, by reason of which an application which would be correct at Washington would inevitably fail at Berlin." Since most of the applications are not prepared by the applicants themselves, it follows that the attorneys are at fault. It should, therefore, be the aim of every inventor who seeks the protection of foreign patent laws to employ as his agents only attorneys thoroughly familiar with foreign patent practice.

"Specifications and claims for patents on American inventions," continues the report, "are frequently presented in the form of translations made by persons who have only acquired a superficial knowledge of German. Such translations, made with the aid of a dictionary, mechanically translate the words, and not the meaning, of important phrases, so that the specifications and clauses as filed are often incomprehensible. This entails additional correspondence, corrections, and frequently long delays which might have been obviated. Few persons, comparatively, are capable of translating a technical description so that it shall mean exactly the same in a foreign language as in the original, and it is this want of exact completeness that often loses a foreign patent or renders it, if gained, loose in its provisions and impaired in value."

The theory and definition of what constitutes a patentable invention differs widely in the United States and in the German Empire. "This difficulty is more especially obvious and serious in the case of a machine composed of a number of parts, on each of which priority of invention is claimed." In the United States new constructions and combinations can be patented which in Germany can be protected only by several patents, for the reason that the German patent rules would require a division. How lamentably inadequate a mere translation of an American patent specification must be in such cases is obvious. A specification thus improperly presented "entails delay, expense, and introduces a new element of uncertainty into the case, since one or more of such separate claims, which are all covered by one American patent, may be rejected by the German examiners.

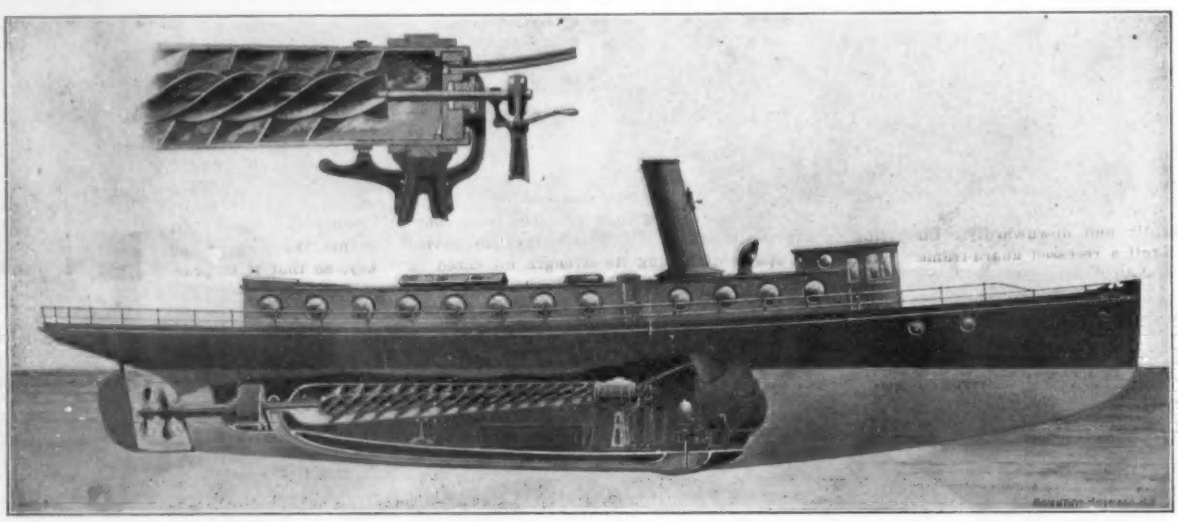
"Each claim in the United States must be complete in itself, which not only means that no reference may be made from one claim to another, but also that each claim must cover a combination quite separate from and independent of the other claims. Quite the opposite is the case in Germany. Here the first claim is the statement of the invention, and all other claims must fall within the same scope. In this country (Germany) any number of 'modifications' may be introduced in the subsidiary claims, while in the United States 'alternative constructions' are inadmissible; and subject-matters introduced as 'modifications' in subsidiary claims in Germany can only be properly claimed in the United States as new combinations quite separate from and independent of the other claims."

In conclusion, Mr. Mason emphasizes the fact that "no foreign people apply for and obtain so many patents in the United States as Germans, and in no country is it more necessary and to the advantage of American inventors to protect their inventions by patents than in Germany. A clearer and more exact understanding of the many differences in practice and theory between the two countries . . . would save not only time and money, but avert friction and litigation."

COL. J. J. ASTOR'S MARINE TURBINE.

The phenomenal speeds achieved by the "Turbinia" type of fast vessels, and the great satisfaction which the passenger steamer "King Edward" is giving in regular service on the Clyde, afford good reason to believe that the steam turbine is destined to play a most important part in marine propulsion, both in the navy and the merchant marine. The records of the Patent Office prove that a great amount of thought is being given to the development of this form of motor; and, in spite of the excellent results which have already been attained, there is no reason to doubt that the turbine will be further improved, both as to its compactness and its efficiency, and will pass through a development comparable to that of the reciprocating steam engine.

The accompanying illustrations have been drawn to show the details and methods of operation of a marine steam turbine designed by Col. John Jacob Astor, who, after giving much thought to the subject, is convinced that the steam turbine is capable of improvements which will overcome some of the difficulties inherent in the present type.



COL. J. J. ASTOR'S DESIGN FOR A MARINE TURBINE.

The Astor turbine is distinguished broadly from the best-known existing forms by the fact that it has no stationary parts other than the journals and foundation frames which carry it, the casing of the turbine revolving as well as the shaft, but in an opposite direction. The general construction of the motor is shown clearly in the accompanying sectional views. It consists of an interior shaft which extends from the forward journal through to the rear propeller. Upon this shaft is formed a series of spiral blades, which have a steady increase in diameter from the forward or admission end of the turbine to the rear or exhaust end. The shaft and blades rotate within a flaring, funnel-shaped casing, around the inner surface of which is formed another series of spiral blades, also of increasing diameter, whose twist is in the opposite direction to that of the blades on the shaft, the two sets of blades or vanes being respectively right and left-handed. The tubular casing is drawn down at the exhaust end to form a hollow shaft, which incloses the central shaft, and extends through the deadwood and the sternpost. The propellers are right and left-handed to match the direction of the blades of the respective shafts to which they are keyed, the two propellers thus rotating in opposite directions.

The casing increases in diameter at the proper rate to secure an even rate of expansion of the steam, which is conducted from the exhaust through a length of piping formed in the keel of the launch, the keel thus being made to serve the purpose of a condenser. The condensed steam collects in a well from which it is drawn by the boiler feed pump. Steam is admitted to the forward end of the turbine, and, striking on the two sets of blades, the shaft is rotated to the right and the outer, movable casing to the left, the respective propellers being, of course, driven in corresponding directions.

As compared with the ordinary reciprocating engine, the marine turbine presents the great advantage that it is perfectly balanced. The balancing of the reciprocating engine is to-day a more or less unsettled problem. Even the high-speed Atlantic vessels, whose engines have been built on the Schlick-Tweedy system, are subjected to an annoying amount of vibration. A further advantage of the marine turbine is found in the fact that the center of gravity of the motor lies near the axis of the propeller shaft; whereas in the vertical reciprocating marine engine, the position of the cylinders, crossheads, connecting-rods, etc., above the shaft must necessarily raise the center of gravity from several inches to several feet, according to the size of the engine, above that of the turbine motor. There is, moreover, the advantage of a perfect expansion, the steam, however high its initial pressure, being expanded down to zero at the point of exhaust.

As compared with turbines of the Parsons type, it will be seen that in place of a fixed casing and blades, inclosing a rotating shaft and blades, in the Astor turbine both the casing and the shaft rotate, but in opposite directions. Col. Astor believes that the extremely high speeds necessary to secure the best results in steam turbines are a serious disadvantage, which it is desirable to get rid of by other means than by elaborate gearing. By applying the energy of the steam in rotating both the central shaft and outside casing he has sought to reduce the rotational speed by fifty per cent, and still secure the same power at the propellers, with a theoretical gain in efficiency due to the use of two propellers instead of one; for it is claimed that there is a decided gain in propeller efficiency, due to the fact that the rotation of the first or forward propeller gives the water at the stern a rotary or whirling motion, and forces it aft in a favorable direction for the action of the second propeller, and thus the combined efficiency of the propellers is increased. Moreover, judged in its effect upon the helm, the wash of the second propeller corrects that of the first and the flow of the streams of water is more truly parallel with the axis of the vessel, thus insuring a more perfect action of the helm. The inventor considers that there are decided structural advantages in placing two propellers on the center line of the ship, seeing that the double shaft passes through the sternpost and deadwood and is, therefore, held by the most rigid portion of the vessel. Col. Astor has applied for patents in the United States and the principal foreign countries.

New Methods of Duplicating Sound Records.

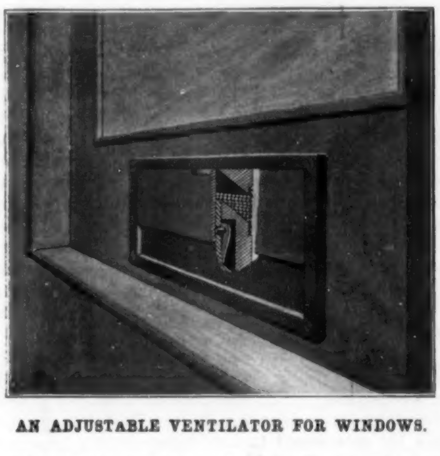
In the usual method of making duplicate sound records for phonographs the blank wax cylinder is first cast and trued with heated tools. Upon the cylinder thus treated the record of sound is engraved or cut. From this record matrices are made, and from these matrices in turn the duplicate sound record is produced. A Newark inventor, Mr. Ademor N. Petit, employs a somewhat different method. The matrix is connected with a suitable support. A hollow core, concentric with the matrix, is secured to the support so that a space is left between the core and the matrix. In this space the duplicate record is made. The usual melted composition is forced into this space by immersing the matrix and hollow core. As the composition advances, air is permitted to escape. When the end of the space has been reached the escape of the air is cut off, thereby preventing the further advance of the composition. Pressure is now applied to consolidate the composition and cause it to fill all the interstices of the matrix. By applying water to the inside of the core the matrix is cooled from within outward. The cooled duplicate sound record is then separated from the matrix and core by a special device.

In another method for duplicating records invented by Mr. Jonas Aylsworth, of East Orange, and Mr. Walter H. Miller, of Orange, N. J., the matrix or mold, carrying on its bore a relief of the record to be duplicated, is immersed in the bath of molten wax composition. This immersion causes the molten material

to fill the bore of the matrix without in any way touching the exterior. The reduced temperature of the matrix relatively to the molten material causes the latter to coagulate or chill upon the bore until a layer of the desired thickness has been secured. After this the matrix or mold is removed from the bath of molten metal, and the bore of the duplicate is finished by a reamer. The resulting duplicate is finally removed from the matrix or mold by shrinkage. The duplicates can be made much thinner than the ordinary original records, and therefore more economically, since the material removed by the reaming tool is used for the manufacture of subsequent duplicates.

AN ADJUSTABLE VENTILATOR FOR WINDOWS.

A simple ventilator for car-windows or other windows, which affords convenient means for adjustment



AN ADJUSTABLE VENTILATOR FOR WINDOWS.

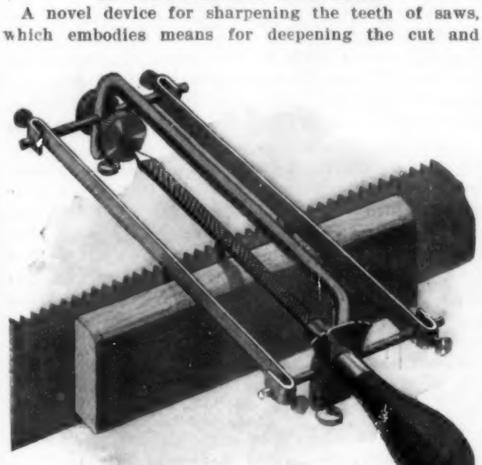
to graduate the opening of the ventilator so as to open it partially or entirely, is the subject of the accompanying illustration. The inventor of the window is David E. Werts, of Grants Pass, Oregon.

The sash is held to slide vertically in the window-frame; and the improved ventilator is placed in the lower rail of each sash. This lower rail has a horizontal slot leading outwardly and downwardly. On the inner side of the sash-rail a recessed guard-frame is secured, which frame is slotted to register with the slot of the sash-rail. The exterior opening of the slot is covered with a woven-wire cloth. Slidable in the recess of the guard-frame is a gate, upon which a plug bears. The plug projects from the free end of a flat spring secured by one end in a cavity in the sash rail, and through a perforation in the guard-frame. It will be seen that the impinging of the spring-pressed plug on the gate will retain the gate at a desired point of open adjustment. The relative position of the plug is such as to adapt it to project its free rounded end through the perforation in the guard-frame for a short distance, so as to support the gate when elevated sufficiently to close the sash-slot completely.

The improved ventilator is of special value as a means for ventilating passenger cars as well as bedrooms, the air being admitted in volume which may be exactly graduated so as to meet all sanitary requirements and to avoid any excess which would cause an improper air current in the room or car.

AN IMPROVED SAW-SHARPENER.

A novel device for sharpening the teeth of saws, which embodies means for deepening the cut and



AN IMPROVED SAW-SHARPENER.

changing the pitch of the saw-teeth, is the subject of an invention for which Ira L. Bulson, of Jacksonville, Fla., recently received a United States patent.

The device consists of an arched frame-bar, the depending limbs of which are slotted. In one limb a screw-plug is fitted, carrying two jam-nuts embracing the limb; and in the other limb-slot a shank is fitted on which a handle screws. Between the shank and the screw-plug the saw-file is held. In order to regulate the depth to which the file shall cut, two gage-bars are provided, located on opposite sides of the frame-bar and adjustable on cross-bars carried by the depending limbs. By means of set-screws operating in conjunction with clips, coacting with the depending limbs of the frame-bar, these gage-bars are adjusted in a vertical direction. In sharpening the teeth of the saw, in the usual manner, it is evident that these gage-bars will limit the depth to which the teeth are cut, so that all the teeth of the saw are uniformly cut. In order to indicate the inclination of the file, the instrument is provided with a gage comprising a graduated face carried by the shank and a movable finger free to travel over the face to indicate the position of the file.

The improved implement is available for use either on cross-cut or ripping saws, and does not require expert handling to secure good results. The gage-bars limit the depth of cutting, which may be nicely graduated by the adjustment of the set-screws, and the rocking adjustment of the index-finger controls the degree of angular inclination given to the body of the file-bar, so that teeth of exact size and pitch can be formed on a saw-blade or defective teeth renewed and rendered perfect.

Requisites of the Perfect Car Coupler.

Many inventors will probably remember the paper read some three years ago by Mr. Pulaski Leeds before the Central Association of Railroad Officers on the subject of "Car Couplers." Mr. Leeds began his paper by asking: "Does the present style of vertical-plane coupler meet all requirements? Has it come to stay?" Mr. Leeds was of the opinion that the vertical-plane coupler was by no means a perfect contrivance, and was still more of the opinion that it had come to stay. He enumerated the conditions and requirements of service; and these he states are: First, that the concussion should be evenly and squarely met on a central line; second, that the pulling strain should be on a central line to avoid all tendency to crowd the flanges against the rail; third, that the connection should be so flexible that there should be no unnecessary friction at any time or difficulty in coupling on any practicable curve; fourth, that the device should be capable of having its strength increased to meet future requirements of heavier motive power; fifth, that it should be always operative; sixth, that there should be as great a uniformity as there was in the link and pin.

Mr. J. B. Thomas now comes to the fore with a paper presented at the St. Louis Railway Club, in which he further discusses the interesting question first opened by Mr. Leeds. The increase of break-in-twos and in the wear of truck-wheel flanges, together with the need of improvements in draft-rigging, have shown that the present coupler may be considered the direct cause of many accidents. In every scrap-heap in the railway yards many couplers may be seen, the shanks of which are broken anywhere from two to eight inches back from the shoulder. From templates constructed according to the strict Master Car Builders' rules it is found that the greatest angle obtainable by two cars in rounding a curve without impinging against the side is 10 degrees. When a greater angle than this is obtained the side motion of the car may produce lateral pressures of from 3,000 to 57,000 pounds on the couplers.

In order to determine the relative positions of two freight cars standing on one of the curves found in the freight yards at St. Louis, Mr. Thomas made an interesting investigation. Of seven sets of intersecting lines of as many pairs of cars, the least angle produced by any two of these lines was 18 degrees. The greatest angle recorded was 28 degrees. None of the cars was over 35 feet long. Any two 40-foot cars would have increased the angle on any of these curves 4 degrees.

In the face of these facts Mr. Thomas believes that a radical departure must be made from the style and dimensions of the couplers now in general use. Their continuation means worn rails, split draft-timbers, damaged carrier-irons, worn wheel-flanges, increased tractive resistance to trains, and an increased number of break-in-twos.

Mr. Thomas has himself invented a coupler for the purpose of avoiding many of the evils which have been cited. He knows that he has not a perfect coupler; but it possesses certain essentials, nothing short of which will satisfy the demands of the present and the future. Since these essentials may be of some interest to prospective inventors of car-couplers we give them for what they are worth. The essentials are: First, that the coupler will couple on any practicable curve known in railway construction, regardless of any difference in the cars to be coupled; second, by yielding to the varying motion of the cars in rounding a curve, the coupler avoids that terrible strain which cuts away the flanges of wheels, destroys the draft-timbers, and injures the car; third, the coupler is always operative; fourth, it confines the natural wear to certain small parts whose total weight is about 30 pounds, besides which, these parts being relieved from excessive strain by the drawhead's flexibility will wear only about one-fourth as rapidly as will the corresponding part of the coupler now in use.

DEVICES CURIOUS AND INTERESTING.

BOTTLE-HOLDER.—A detachable bottle-holder is an appliance which will commend itself to any housewife who knows how difficult it is to grasp the stout glass bottles in which milk is sold in our large cities. The improved holder which we have shown consists of a piece of wire, bent to form a closed and an open loop. The closed loop embraces the body of the glass bottle, and the open loop the neck. The open loop is made to hug the neck of the bottle by means of a clasp embracing that part of the holder which is to be grasped by the hand. The clasp is slipped downwardly on the handle-part in order to release the neck portion of the device and to permit the holder to be removed. Mr. Wilfred H. Goddard, of Chelsea, Mass., is the inventor of the holder.

MILK-BOTTLE HOLDER.

KEY-KEEPER.—The burglar who tries to pick the lock, the key of which is held in the manner shown in our illustration, will probably be disappointed. His efforts would be very effectually frustrated by a key-keeper consisting of a pair of vertical arms having extensions which fit within the ring of the key, so that it is practically impossible to turn the key from the outside. The key-keeper is the invention of Albert B. Lang, of St. Louis, Mo. The invention is obviously a simple and efficient appliance.

A KEY-KEEPER.

HILL-CLIMBING SHOE.—A form of shoe which is rather peculiar is the invention of John E. Fenno, of Hoisington, Kan. Mr. Fenno's shoe is designed particularly to facilitate walking when ascending hills. The invention comprises a vertically-extensible heel-portion arranged to elevate the heel so that the sole of the foot will be in a horizontal position in advancing uphill. The inventor believes that hill-climbing, by means of his invention, will be a far easier matter than formerly, since a more erect and comfortable attitude will be preserved with less fatigue.

HILL-CLIMBING ATTACHMENT FOR SHOES.

MARSH-SHOE.—A Canadian inventor, Mr. Albert Drouillard, of Windsor, Ontario, has invented another peculiar shoe, which is to be used by hunters in pursuit of game over swampy ground. The shoe consists of a flexible disk formed with a rigid rim which prevents slipping. Straps secure the sole of the boot to the disk. Furthermore, an air pipe communicates with the under side of the disk with the heel. The body of the disk acts as a flexible diaphragm, and its action in lifting up the heel is similar to that of a diaphragm-pump. Air is sucked in through the pipe and conducted beneath the disk to permit the ready withdrawal of the marsh-

MARSH-SHOE

shoe. The inventor claims that a hunter may step into deep, miry ground up to his knees, and that the air will still be drawn in, so that extrication will be a matter of no difficulty.

A Method of Repairing Burnt-Out Incandescent Electric Lamps.

It is a well-known fact that the filament of an incandescent bulb is partially volatilized by the electric current. The particles of carbon volatilized cling to the inner surface of the bulb and thus prevent, to a certain extent, the transmission of light through the glass. Moreover, the resistance of the filament is very considerably increased, and the light efficiency of the lamp correspondingly decreased. Many attempts have been made to use the bulbs of these burnt-out lamps over again; and in many instances the inventors have suggested the withdrawal of the old filament. Obviously, this is a costly process and more difficult than the manufacture of the original lamp.

An English inventor, Mr. Ferdinand Fanta, of London, contrary to the general belief, holds that the entire body of the filament does not volatilize and lose its lighting efficiency, but deems it more probable that the core of the body of the filament, after having been in use for several hundred hours, is often in a better condition than when originally inserted in the lamp. This he accounts for by the fact that the original carbonizing process which the filament must undergo before its insertion in the bulb, is performed too rapidly, and that the process known as "reinforcing" or "flashing" of the filament is carried out under unsatisfactory conditions. In most instances, according to Mr. Fanta, these conditions are entirely at variance with those under which the filament is used in actual practice. The result is that, when the filament is used in a more or less perfect vacuum, the atmospheric air still retained or imprisoned in the pores of the filament becomes available for combustion, so that the outer coating of the carbon of the filament slowly combines with the air. The carbon monoxide vapors thus formed are condensed on the inner surface of the glass bulb, which acts as a condenser. In order to restore its lighting efficiency to an electric incandescent lamp which has reached this stage, the inventor considers it first indispensable to free the bulb of its carbon deposit, and to redeposit the carbon on the partly-burned or spent filament.

In order to carry out these ends, Mr. Fanta first of all removes or cuts away the small protruding point of glass formed on the bulb after it has been hermetically sealed. In place of the point, a small glass tube some four or six inches long is fixed to the glass. The bulb is then heated interiorly, preferably by a flame applied successively over the surface, to burn the carbon deposit on the inner glass surface. This operation is facilitated and rendered practicable at temperatures not injurious to the integrity of the glass and to the preservation of the capping of the filament, by causing previously heated air to circulate freely in the bulb while the gases resulting from combustion are simultaneously drawn off by means of a pump. After a short period of application of this cleansing process, the glass of the bulb appears quite clear and free from carbon. The bulb is now ready for the process of depositing carbon on the filament. For this purpose, having created as perfect a vacuum as possible in the bulb, the inventor introduces, by mechanical circulation under controllable pressure, a gaseous hydrocarbon (purified coal-gas) with an admixture of a certain quantity of free atmospheric air, the proportion and percentage of which varies in accordance with the voltage and the candle power of the filament, and with the conditions of the vacuum in the lamp to be treated. An electric current is now passed through the filament. Carbon deposits on the filament; and obviously the resistance diminishes while the candle power increases. Since the object is to restore the carbon filament to its original smaller resistance and higher candle power, the operation is begun with a variable resistance inserted in the main regenerating circuit. Gradually this resistance is increased simultaneously with the passage of the carbon on the filament to compensate for the increasing section and to reduce the resistance of the filament. A photometer is used to standardize the light. When the voltage and candle power have reached the desired point, the operation is stopped. The bulb is now exhausted and sealed in the usual well-known manner.

Mr. Fanta has found that the proportion of atmospheric air and the gaseous mixture should vary from 3 to 10 per cent, according to the nature or condition of the filament to be "flashed," the percentage of either being smaller for filaments of low candle power than for filaments of high candle power. With a burned filament of irregular cross-section and in poor condition, the percentage of air must be kept at the lowest value until the filament has been reinforced at its weakest parts. Not until then can the percentage of air be increased.

Legal Notes.

Recent Patent and Trade Mark Decisions.

Justice Colt, of the United States Circuit Court of Appeals for the First Circuit, recently handed down a decision in the matter of Swain vs. the Holyoke Machine Company, in which public sale or use prior to the application for a patent is discussed at some length. Asa M. Swain, the complainant, filed an application on January 10, 1881, for a turbine water-wheel, the patent on which was issued fourteen years later, on March 12. The court below dismissed the bill on the ground that there had been an unrestricted sale of the machine embodied in the first three claims, more than two years prior to the application. The fact that the machine had been thus sold was clearly brought out before the Circuit Court. To overcome the bar of the statute, the complainant sought to prove that the sale was for the purpose of experiment only, and that the first machine used publicly was incomplete.

The court, however, found that the machine alleged to be incomplete contained the invention in its finished form, and that the inventor could not relieve himself from the consequences by showing that it was installed with slight imperfections. The court was clearly of the opinion that the inventor intended to sell, and did sell, with a full knowledge and understanding of his invention, a machine that embodied his whole invention, and that the date at which this machine was sold was two years prior to the time at which his application for his patent was filed. In the light of these circumstances the court found that the machine was not merely an experimental device, and that the patent granted to Swain was invalid. The fact that the inventor had failed to test the efficiency of his machine or conducted any tests after it was put in use indicated that no experiments had been made.

A case of equal interest to inventors was decided in the Ninth Circuit of the Circuit Court of Appeals, Justice Gilbert delivering the opinion of the Court. The appeal in this case (Johnston vs. Woodbury) was taken from the final decree of the Circuit Court, dismissing the appellant's bill in a suit brought for infringement of the first two claims of a patent on an ore concentrator. The invention was an ore concentrator, the novel feature of which was claimed to be an endless belt of canvas or of rubber, having integral raised edges traveling longitudinally over two drums and at the same time having a lateral shaking motion. Finely crushed sulphurets mixed with water to form a thin pulp are fed to the surface of the belt. It is the purpose of the lateral motion combined with the longitudinal movement to separate the sand from the sulphurets and to cause the sand to travel downwardly and pass over the tail end of the belt, while the sulphurets are carried up and over the head of the belt into a tank. It was established on trial that to accomplish this result the pulp must be evenly distributed over the surface of the belt. The defense principally relied upon, and sustained by the Circuit Court, was that the appellant's patent lacked invention, in view of a prior patent, in which a construction was described that could be made to operate as the appellant's invention, although there was nothing to indicate that the patentee contemplated such operation. It appeared from the evidence that those who used the patented invention modified it to secure the result of the appellant's invention, for which reason it was held that the appellant could not be regarded as the first inventor. Although the persons who used the prior device did not place the supports of their belt-frame at the precise angle preferred by the appellant, and while they did not contemplate or specifically desire to obtain an oscillatory motion of the belt, nevertheless they obtained such a movement, and what they did, the court held, must be regarded as an anticipation of the appellant's invention. The decision emphasizes one of the most important principles in American patent law—a principle by which it is held that the inventor of a species is the inventor of the entire class to which that species belongs, although he may be unaware of the actual extent of the applicability of his invention.

The proprietors of Pears' soap, Messrs A. & F. Pears, Ltd., sued the George S. Pears Soap Company, to restrain them from using the word "Pears." Justice Hook in the United States Circuit Court for the Western Division of the Western District of Missouri, granted a temporary injunction to stop the business of the defendants. The temporary injunction has since been made permanent by Judge Philips, of the same court.

In his oral opinion, Judge Hook reviews the history of the makers of the original Pears' soap and finds that they have spent large sums in advertising their product, and that there has been a continuous and consistent effort to make the name "Pears" a most prominent feature in the system of advertising. The court admitted that the name Pears was not a lawful subject of a trade-mark, technically considered; but it was undoubtedly true that, when a name had acquired a secondary signification, so that its use by another would amount to a fraud upon the public and upon those properly entitled to the name, steps should be taken to prevent the fraudulent use of the name.

It seems that in 1898 a corporation which styled itself the "George S. Pears Soap Company" was organized under the laws of the State of Missouri. One of the incorporators was a barber, George S. Pears by name, who seems to have been the leading spirit of the company. As a prerequisite to lawful incorporation the laws of Missouri require a payment of a certain percentage of the authorized capital. Although the incorporators certified to such payment, nothing whatever was paid by the stockholders into the treasury beyond the actual fees and expenses of preparing the documents relating to the incorporation. Pears insisted that his name should be given to the corporation. He testified that a certain unnamed friend had given him formulæ for the manufacture of soaps.

It appeared from the testimony of persons connected with a well-known soap manufacturing company of Kansas City that it had furnished the George S. Pears Company with unstamped bars of glycerine soap, and that these soaps were not made according to any formulæ furnished by George S. Pears or any one else connected with him. It seems that after these soaps had been purchased in Kansas City they were cut and pressed by the George S. Pears Company into oval shapes similar to the English soaps, and then wrapped and boxed for the trade. In the stamping of the soap, and upon the wrappers and the boxes the word "Pears" was made a prominent feature. The complainant and its ancestors had sold scented and unscented glycerine soaps. The defendant placed upon the market similar soaps.

Although the Court admitted that there were differences in the marking and dressing of the soaps of the two companies, yet it was thought that the method pursued by retail druggists in handling and exposing soaps for sale would lead an unsuspecting purchaser to mistake the English soap for the other. Indeed, testimony showed that such was the case.

After having carefully examined the proofs the Court was convinced that "the very organization of the George S. Pears Company was conceived with a fraudulent and unlawful purpose, and that the design of the persons connected therewith was to trade upon the name, fame and reputation of the complainant. . . . The differences in the soaps of the two companies and the dressing marks and boxes are not sufficient to prevent any imposition upon the public or an invasion of complainant's rights. The use of the word 'Pears' in designating the defendant's soap is alone sufficient . . . to deceive the ordinary customer."

The decision is entirely in line with that rendered in the Rogers Silver Plate case and similar causes.

On October 30 last the Circuit Court of Appeals for the Second Circuit handed down a decision reversing the decree of the Circuit Court in the case of Brickell et al. against the Mayor, etc., of the city of New York. Few patented devices have been the subject of more legal decisions than this feed-water heater. When Judge Coxe, on June 7, 1900, rendered a decision awarding the complainants $951,070 everyone heaved a sigh of relief. It was hoped that the Brickell matter had finally been disposed of. This suit was commenced over thirty years ago to recover damages and profits for the use by the city of New York on its steam fire engines of a feed-water heater covered by Letters Patent No. 81,132, granted August 18, 1868, to William A. Brickell. The judgment is now set aside for errors in determining the amount of profits for which the city was liable, and a new accounting is ordered. Judge Wallace, who wrote the opinion of the Circuit Court of Appeals, holds that while the patent is valid, its scope must be very much limited, and in view of these limitations it may be considered doubtful whether the complainant will *ever* obtain a substantial recovery against the city. The Brickell feed-water heater, strange to say, is not the only device which the Fire Department of New York has been charged with using unlawfully. The Knibbs' valve, for which judgment against New York city was handed down a few months ago for a sum of nearly a million dollars, has also been used by our Fire Department without being properly entitled to such use, if the plaintiffs are to be believed. Both of these cases have dragged along year after year. The Brickell case has been exhaustively discussed in the Scientific American for June 10, 1899.

Contents.

(Illustrated articles are marked with an asterisk.)

RECENTLY PATENTED INVENTIONS.

Mechanical Marine Contrivances.

PROPELLER.—JOHN BARNETT, Hotel Irvine, Chicago, Ill. This new form of propeller-wheel is designed to secure the more efficient propulsion of the vessel and is to be used in a series so arranged that the discharge of water from one propeller does not interfere with the effective action of the next propeller in the rear. Each propeller-wheel comprises a shaft having a rigidly-attached disk provided with spiral blades winding around the shaft. These blades have a free outward discharge away from the disk.

Engineering Improvements.

ENGINE-VALVE.—CHARLES G. HOLMBERG, Woonsocket, So. Dak. The admission and exhaust of steam to and from the engine-cylinder are properly controlled and the desired cut-off is obtained by means of a valve, comprising a main portion and an auxiliary portion, the one controlled from the other. The auxiliary portion has cut-off flanges each provided with a port adapted to register alternately with ports in the valve-chest. A cut-out portion or cavity permits the passage of the exhaust.

Locks.

LOCK.—JASPER H. WILSON, Rockwood, Tenn. The invention provides a bag-fastening lock, and particularly a lock designed to secure the mouth of a mail-bag. The essential features of the construction are a case slotted in its side to receive an apertured tip-plate on the mail-bag strap; the case being securable on the mail-bag; a staple in the case, and a rockable latch bar. A hook member on the latch-bar is arranged to pass through the tip-plate, and then through the staple. To rock the latch-bar away from the tip-plate and staple, a spring is employed. A device is provided for retaining the latch-bar in engagement with the tip-plate and staple. The hook member of the latch-bar is released from the tip-plate and staple by means of a key. The invention provides a lock which is simple and efficient.

COMBINATION-PADLOCK.—THOMAS W. HART, Ebenezer, S. C. The inventor has devised a simple and practical combination padlock of small cost, which is easily operated, is not liable to get out of order, and cannot be opened by anyone ignorant of the combination. The shank of the keeper is locked in the case by transverse sliding bars, the opposite ends of which project outside of the case. The invention is intended for use as a stop-lock, door-lock, or any other form of lock for which it may be applicable. One of the features of the construction is the tumblers which are provided at both ends with heads limiting their movement. Thus the necessity of providing any separate means for holding the tumblers in the case is avoided.

Railway Contrivances.

RAILWAY SYSTEM.—JOHN W. JENKINS, 124 Front Street, New York city. The purpose of this invention is so to improve a railway system that passengers can enter and leave a car without stopping the movement of the train. To this end a number of riders or saddle cars are employed, which are successively taken up and dropped from the moving train, and through the medium of which passengers can enter or leave the car without interrupting the movement of the train.

Vehicle Accessories.

WHEEL.—CHARLES RENARD, 33 Rue Cambon, Paris, France. The inventor has devised an improved wheel-felly provided with a detachable rim. The invention is to be used in connection with the fellies of vehicle-wheels having pneumatic tires. The invention is principally characterized by the combination with circular channels formed in the pulley of one, two, or more wires arranged in such a manner as to permit one of the edges of the felly to be withdrawn for the purpose of detaching the tire.

MUD-GUARD FOR BICYCLES.—SPENCER MILLER, Rochester, N. Y. The object of the invention is to provide an attachable mud-guard for a bicycle, which is adapted for rocking adjustment so as to hold the guard securely in lowered position for service, or in an elevated position when not needed.

ELASTIC TIRE.—WILLIAM F. WILLIAMS, 17 and 18 Great Pulteney Street, Golden Square, London, Eng. The invention relates to the manufacture of elastic tires of the solid or cushion type. With the object of preventing lengthening or tearing of the tires of motor-car driving-wheels, Mr. Williams embeds in the thickness of the tire, cords or strands which are knotted at frequent intervals, so as to obtain a number of reinforcing points of abutment or resistance to tensional strain. The cords extend around the tire in the circumferential direction of the wheel, and in one layer or in several separate layers located particularly toward the tread of the tire. To these cords, branch cords, also knotted at intervals, are attached, the branch cords diverging herringbone or V wise, so as to reinforce the main spans.

VEHICLE-SPINDLE. — JOSEPH DARLING, Chicora, Pa. Mr. Darling has invented a device for securing nuts upon the outer ends of spindles of vehicle-axles whereby the nuts are prevented from accidentally turning off and from being turned too tightly upon the spindle. The nuts, moreover, can be secured in any desired adjustment upon the spindle.

Miscellaneous Inventions.

BUCKSAW.—CHARLES T. REDFIELD, Glenhaven, N. Y. The present invention, an improvement upon a similar device patented by Mr. Redfield, relates to the means for connecting the continuous brace-bar, which overlies the arch bar, with the end-bars of the saw-frame. The connection of the brace-bar with the end-bars is facilitated, and adjustment at such point is permitted, so as to aid in tightening the frame in taking up any slack that may occur.

VETERINARY INSTRUMENT. — ABRAHAM VAN ROEKEL, Sioux Center, Iowa. The invention comprises a number of peculiarly-arranged finger-like rods adapted to be introduced into the vagina of an animal and to lie around the muzzle of the fetus. One of these rods carries a prong having a limited movement, and a cord is passed around the ends of the rods, so that when the muzzle of the fetus is properly inclosed by drawing on the cord the rods are engaged firmly therewith and the prong is caused to enter the skin of the fetus. These firmly grasped, the fetus can be readily drawn out of the vagina as the animal labors.

FISHING-REEL.—JAMES H. SMITH, Salisbury Mills, N. Y. The prime object of the invention is to provide a device which will give the fisherman a signal the instant that the hook has been taken by a fish. Combined with a frame is a reel, a bell, and a spring-sustained clapper arranged to turn simultaneously with the wheel. The instant the wheel proper is turned in either direction the clapper will sound the bell.

EGG-POACHER.—PETER C. QUAKENBUSH and CHARLES F. CARLSON, Paterson, N. J. The egg-poacher comprises a frame to which a cup is secured. A movable bottom, consisting of sections hinged to the cup at opposite sides, is provided with outward extensions. A slide is carried by the frame. Links, each having one end secured to the slide and the other end to the extension of a bottom section, complete the construction. The eggs when poached are readily freed of the adhering water and can be placed upon a dish or plate without the necessity of lifting them out of the poacher with a spoon.

CLEANSING FILTER.—AUGUSTINE J. MADDEN, 187 Little Collins Street, Melbourne, Victoria, Australia. This invention has been devised to provide an efficient high-class filter so constructed that a simple action of the person turning on or off the cap (which takes the place of the ordinary draw-off cock on a water pipe) causes the filter automatically to cleanse and flush away the residue collected from time to time.

REGISTER.—EUGENE B. LOBACH, Denver, Colo. The register is arranged to control the admission of heated air into apartments. The register has a face or body portion and a case secured to the rear. A gate is held in the case, the case having its edges extended at the rear of the face. The face or body has perforations lying opposite the extended edges of the case. The perforations allow the free circulation of air and prevent heating the margin of the face of the register. This avoids the necessity of providing other means for preventing the convection of heat to the walls of the building.

GARMENT-FASTENER.—FANNY B. MATHEWSON, Manhattan, New York city. This invention relates to improvements in garment-fasteners of the hook-and-eye order. The object is to provide a fastener of simple construction that can be readily attached to a garment without the usual sewing. The device is provided with a loop section and a hook portion forming part of the loop section. The hook portion is to be passed through the goods from the under side and then carried over and passed through the goods from the upper side and engaged with a plate. After thus engaging the hook with the plate, a tongue is to be turned over the hook to prevent a movement of the loop section and disconnection of the parts.

Designs.

BOARD.—GEORGE BARRETT, Victoria, B. C., Can. The design provides a novel form of board which is to be used as a covering or weather board on frame-houses. The leading feature consists of a body having an ogee curve on one face at one edge and a groove in its other face at its opposite edge.

BODY-BRACE.—PHILO B. SHELDON, Erie, Pa. The brace consists of vertically-extending strips laced together. To two of the strips shoulder-straps are fastened; and from others a waistband extends. Below the waistband is a stomach-pad laced to certain of the strips.

ABDOMINAL BANDAGE.—PHILO B. SHELDON, Erie, Pa. From the upper part of vertically-extending strips of equal length a waistband projects, and below this band at the front is a stomach-pad joined in strips by two pairs of straps, the lower pair of which are fastened to the strips at their lower ends and the upper pair of which are fastened to the strips near their upper ends.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Closet bowl, washdown siphon, H. S. Maddock 685,687
Cloth cutting machine, J. B. Gury 685,329
Clover buncher, A. Smith 685,355
Clutch, J. R. Scott 685,353
Clutch, M. C. Johnson 685,721
Clutch, friction, T. C. Menges 685,723
Cock, H. Gibbs 685,597
Cock, safety gas, M. Jakobson 685,612
Coffee pot, A. M. Lawrence 685,456
Coin controlled apparatus, W. F. M. Ricketts 685,642
Controller regulator, A. D. Thomas 685,308
Conveyer, G. G. Howe 685,402
Conveyer, C. W. Hunt 685,515
Conveyer, marine, J. G. Delaney 685,580
Conveying apparatus, J. G. Delaney 685,579
Cooking and drying apparatus, L. S. Burbank 685,671
Corn husking and shredding machine conveyer, A. Rosenthal 685,298
Coronet rolls, A. C. Calkins 685,673
Cotton picker spindle, A. Campbell 685,439
Cultivator, B. G. Paschall 685,636
Cutter. See Can Cutter.
Cutter bar, A. F. Beman 685,557
Cutting tool, F. D. Chambers 685,572
Cylinder wrench, J. P. Johnson 685,282
Dampening machine, R. P. Smith 685,652
Dental implement, G. M. Williams 685,659
Derrick, tramway, B. C. Riblet 685,346
Detector bar apparatus, W. T. Mead 685,339
Digging machine, ditch, C. W. Bradshaw 685,667
Disk or coin holder, G. R. Perry 685,526
Door check, Stewart & Snyder 685,306
Door check, E. I. Blount 685,708
Door, grain, J. Flesher 685,266
Dowel connection, Ashby & Miller 685,555
Draw bar, F. L. Granger 685,272
Drawing instrument, H. M. Lane 685,383
Drilling machine, J. W. Brown, Jr. 685,668
Drilling machine, automatic, G. W. Cilley 685,713
Drying apparatus, L. Atwood 685,243
Drying apparatus, A. P. Meade 685,287
Dust guard, S. J. Johnson 685,382
Dyeing machine, J. H. Steadwell 685,699
Dynamos on cars, mounting and driving, P. Kennedy 685,516
Electric brake, P. P. Crafts 685,393, 685,394
Electric circuit switch, H. P. Davis 685,507
Electric cut out, A. J. Wurts 685,549
Electric furnace, O. Frolich 685,717
Electric generating systems, apparatus for regulating, De Dion & Bouton 685,577
Electric lighting, W. Nernst 685,724
Electric lighting apparatus, W. Nernst 685,726
Electric switch, J. W. Hearn 685,604
Electric distribution system, N. W. Storer 685,494
Electrical indicator, H. & F. W. Faltermayer 685,590
Electricity meter, R. S. White 685,313, 685,314
Electrolytic decomposing apparatus, M. Haas 685,274
Electromagnetic spoils or coils, winding for, J. A. Heany 685,470
Elevated carrier conveyer, L. Clark 685,323
Elevator hoisting mechanism, electric, T. W. Eaton 685,326
Elevator spout, swiveled, C. E. Smead 685,354
Embroidering machine counterbalancing device, J. A. Groebli 685,421
Emery wheel dresser, E. J. Brisben 685,709
End gate, Wilde & Stewart 685,703
Engine. See Air and Gas Engine.
Engine regulating mechanism, hydraulic, J. Shradle 685,532
Engines, air and gas mixing and governing device for gas, W. P. Flint 685,510
Engines, sparking igniter for explosive, A. Krastin 685,404
Evaporator, D. B. Morison 685,482
Expansible frame, H. A. Seymoure 685,695
Fabric. See Carpet Fabric, Insole Fabric, Chenille Fabric.
Fan, electric, G. C. Hawkins 680,720
Feed water heater, F. J. Manley 685,624
Feed water heater and purifier, F. J. Manley 685,625
Feeder, automatic boiler, H. J. Davis et al 685,576
Feeder, boiler, C. W. Hunt 685,280
Feeder, boiler, J. A. Morse 685,408
Feeding device, boiler, J. H. Bullard 685,568
Fence and gate brace tightener, J. R. Wright 685,661
Fence, foldable, W. Borrman 685,247
Fence stays, machine for making steel wire, J. Harris 685,603
Fifth wheel, J. McLaughlin 685,629
Files, sharpening worn out, F. Rowley 685,299
Finger ring, F. R. Stafford 685,653
Fire box, C. W. Hunt 685,682
Fire extinguisher, E. H. Ellis 685,586
Fire extinguishers, gage attachment for compressed air, R. B. Sigafoos 685,304
Fireproof blind, W. R. Kinnear 685,480, 685,481
Fish plate and rail chair, W. H. Hamilton 685,276
Flush tank, C. N. Marcellus 685,409
Food preparation and making same, E. D. Bell 685,665
Frame. See Expansion Frame.
Freezing apparatus, C. W. Vollman 685,310
Fuel saving compound, C. P. Harris 685,719
Fumigating apparatus, H. H. Freedman 685,268
Funnel holder, J. R. & M. P. Hoffman 685,607
Furnace grate, Green & Gent 685,718
Furnace top, blast, S. W. Vaughen 685,498
Furnace valve, regenerative, Williamson & Powell 685,316
Furnaces, subheater for hot air, J. Dellinger 685,581
Gage. See Slide Gage.
Gage, W. P. Moulton 685,690
Game or puzzle, H. H. Qua 685,639
Garment supporter, C. J. Bugbee 685,252
Gas and air mixer, Stone & Stevens 685,414
Gas and oil separator, J. J. Tonkin 685,497
Gas burner, incandescent, J. Mallol 685,623
Gas furnace, W. Swindell 685,539
Gas generating and burning means, W. Glitsch 685,271
Gas generator, acetylene, G. H. Cook 685,259, 685,260
Gas generator, acetylene, White & Harbaugh 685,545
Gas holder tank, O. Intze 685,683
Gas shut off and regulator, automatic, A. C. Eby 685,327
Gate, J. R. Wright 685,706
Gear, compensating, F. C. Billings 685,321
Gearing for transmission of power, wheel, G. S. Baker 685,503
Glass machine, J. Jackson 685,281
Glass or tiling supporting bar, L. Shorigi 685,647
Glove or dress fastener, S. B. Donchian 685,397
Gluing or pasting machine, F. W. Brown 685,566
Gold from refractory ores, extracting, R. McKnight 685,691
Grading machine, road, T. McDonald 685,384
Gradometer, J. H. Bullard 685,569
Grain drying apparatus, P. Leroy et al. 685,336
Grain heater, J. Warrington 685,701
Grain unloader and elevator, F. Jestrab 685,684
Grate, J. F. Casey 685,444
Gun barrel choke attachment, J. C. Broyles 685,609
Hair retainer, Nowacke & Loesser 685,631
Hame fastener, R. H. Waters 685,362
Hammer and riveter, pneumatic, H. H. Vaughan 685,359
Hand case, J. A. Comboie 685,574
Hanger. See Shafting Hanger.
Harness, E. B. Ross 685,434
Harness pad, E. & J. Veitung 685,541
Harvester, corn, H. H. Boenker 685,464
Harvester, cotton, A Campbell ..... 685,440 to 685,443
Harvester, onion, W. A. Schnicht 685,352
Harvester, etc., seat for, H. W. Avery 685,663
Hat mourning band, Burt & Harris 685,391
Headlight, locomotive, J. S. Henderson 685,605
Heating apparatus, fitting for steam, T. F. Dexter 685,396
Heating system, hot water, T. C. Purves 685,734
Hinge, A. L. Fuss 685,679
Hinge and door check, combined, J. Hughes 685,403
Hog scraping machine, J. W. Kohlhepp 685,283
Hoisting apparatus safety device, J. W. Bosarth 685,249
Hook and eye, S. A. Peckham 685,637
Hook. See Locking Hook.
Horse detacher, S. A. Haines 685,375
Horse driving from a distance, device for, H. Grass 685,598
Hose supporter, B. F. Orewiler 685,293
Ice shaving machine, F. H. Lippincott 685,517
Incubator, G. R. & M. O. Adams 685,550
Incubator, L. P. Meister 685,688
Incubators or brooders, hot water or hot air heater for, M. M. Johnson 685,334
Index for books, page, J. N. Colvin 685,257
Insect catching machine, O. M. Maupin 685,285
Insole fabric, woven, W. McIlwain 685,524
Insole making machine, A. B. Fowler 685,373
Insulators in place, screw driver for securing, A. Henry 685,606
Iron. See Sad Iron.
Ironing table, J. H. Williams 685,705
Joint. See Rail Joint.
Journal box and lid, S. J. Johnson 685,381
Keyboard player, Bielefeldt & Silwar 685,245
Key-operating machines, automatic actuating mechanism for, D. Murray 685,127
Kiln, J. W. Le Gore 685,618
Knuckle, compensating emergency, J. J. O'Brien 685,632
Lamp, W. N. Rose 685,297
Lamp, N. Johnson 685,449, 685,479
Lamp, desk or table, A. J. Wurts 685,501
Lamp, electric arc, J. A. Mosher 685,426
Lamp, electric glow, W. Nernst ..... 685,725 to 685,728
Lamp glower, electric, W. Nernst, 685,729, 685,732, 685,733
Lamp glowers, material for electric, W. Nernst 685,730
Lamp glowers, treating Nernst, M. W. Hanks 685,512
Lamp heaters, controlling system for electric, H. N. Potter 685,486
Lamp heating device, electric, H. N. Potter 685,528
Lamps, ballast cut out for electric, H. N. Potter 685,487
Lamps, ballast device for electric glower, W. Nernst 685,731
Lamps, contact key for sockets of electric incandescent, G. H. Proctor 685,295
Lamps, heater cut out for electric, H. N. Potter 685,488
Land roller, A. O. Espe 685,588
Latch, J. C. Deggin 685,578
Lathe indicator, J. C. Miller 685,288
Lathes, center steadying device for wood turning, O. D. Rhodes 685,692
Lavatory or bath, G. L. Woodworth 685,660
Leaf cutter, G. S. Dolloff 685,676
Leather, degreasing, W. W. Adams, Jr. 685,552
Leather degreasing apparatus, W. W. Adams, Jr. 685,551
Leather stretching device, J. Caldwell 685,254, 685,255
Leather stretching machine clamp, J. Caldwell 685,253
Life preserver, G. I. de Irsa 685,611
Link, repair, F. G. Asbill 685,654
Linoleum floor cloth, manufacture of, D. N. Melvin 685,520
Linotype machine, P. T. Dodge 685,583
Lintel block, H. W. Bell 685,318
Lock, F. W. Mix 685,289
Locking hook, automatic, E. L. Weed 685,363
Locomotive exhaust mechanism, R. Harding 685,277
Loom shedding motion, E. Oldfield 685,633
Loom warp tension mechanism, V. E. Morse 685,521
Magazine spring drill, Z. T. Furbish 685,678
Magnetic device for use in alternating current circuits, J. Pearson 685,431
Magneto electric generator, J. S. Mead 685,286
Mail bag receiving and delivering device, G. S. Cromwell 685,324
Match making machine, J. H. Stewart 685,413
Measure, automatic liquid, L. B. Haberly 685,399
Mechanical movement, C. A. Anderson et al 685,241
Mechanical movement, G. Goodline 685,420
Metal planing and shaping machine, G. Richards 685,347
Metal planing machine, G. Richards 685,348
Metals from metal bearing material, separating valuable, C. E. Dolbear 685,508
Milking stool and pail holder, combined, J. H. Beattie 685,419
Mines, packing for drift, gallery, or other openings in, J. Muirhead 685,522

Mop holder, W. B. Hadley	685,275
Motor, W. M. Fulton	685,209
Mowers, etc., draft bracket for, J. W. Pridmore	685,678
Music leaf turner, Shunk & Davis	685,533
Music leaf turning device, G. Culley	685,202
Musical instrument self-playing attachment, A. E. Whitehead	685,346
Musical instruments and automatic music sheet therefor, pneumatic tracker for, H. A. Gally	685,270
Neckwear fastener, W. H. Hart, Jr.	685,513
Needle holder, G. H. Wartman	685,361
Nozzle for drinking fountains, W. H. Dewar	685,675
Nut lock, P. J. Moran	685,340
Observation platform, G. Limbach	685,620
Oil burner, coal, J. G. Maris	685,407
Oil or grease, apparatus for extracting, E. Printz	685,529
Packing box or package, F. W. Dye	685,325
Packing flange, G. Huhn	685,610
Pancreas, obtaining a preparation of the, W. Weber	685,543
Paper feeding machine, W. Bridgewater	685,370
Paper weight, S. H. Huston	685,476
Peat, means for extracting roots and foreign matter from, Sims & Davis	685,651
Peat, treating and drying, Sims & Davis	685,650
Pegging machine anvil, I. Frechette	685,398
Pen, self filling fountain, R. Conklin	685,258
Photograph developing apparatus, S. Quincey	685,640
Photographic printing apparatus, A. Pickard	685,432
Photography, apparatus for submarine, L. R. Walkins	685,473
Picture frame support, adjustable, F. McIntyre	685,458
Piling, metallic sheet, G. W. Jackson	685,447
Pipe coupling, automatic, J. E. Forsyth	685,267
Pipe lifter, Odette & Gosselin	685,385
Pipe or rod carrier, T. G. Stiles	685,357
Pipe union, G. H. Schamp	685,691
Pipe wrench, W. S. Tubbs	685,655
Plastic compounds, preparing, C. Reisner	685,409
Plow, H. A. Bean	685,556
Pneumatic despatch tube apparatus, transmitter for use in, J. T. Cowley	685,674
Pool table, Genter & Beach	685,506
Printing press punching attachment, A. O. Hayes	685,490
Printing surfaces, making, C. A. O. Rosell 685,461,	685,472
Propelling apparatus, boat, D. R. Sheen	685,437
Pulley, ribbed, Galloway & Whyman	685,280
Pulp cylinder machine, H. Gaara	685,374
Pulp, reclaiming, F. A. Franklin	685,593
Pulp washing machine, F. A. Franklin	685,591
Pump rod balance, A. A. Koch	685,617
Punch, ticket, W. E. Clow	685,497
Push button support, electric, H. F. Keil	685,614
Rail joint, C. B. Mead	685,519
Rail joint, Burger & Williams	685,672
Railway cattle guard, S. A. Ruddell	685,693
Railway crossing barriers, means for automatic operation of, H. Siegmann	685,393
Railway, electric, Arno & Caramagna	685,242
Railway, marine, J. L. Crandall	685,714
Railway rail fastening, metallic, J. S. McAwley	685,523
Railway sleeper and chair, A. Anderson	685,553
Railway tie, composite, R. M. Chapman	685,392
Railway track cleaner or flanger, Martin & Emerson	685,425
Reclining chair, Davis & Sturm	685,371
Refrigerator, J. G. Ogden	685,343
Refrigerator, R. Hirsh	685,475
Revolver, C. P. O'Neill	685,292
Rheostat, T. S. Perkins	685,485
Roasting furnace, E. B. Parnell	685,344
Rolling mill, J. Fawell	685,468
Rotary engine, R. Sanderson	685,646
Rotary explosive engine, C. A. Marrder	685,722
Router, carpenter's, A. F. Schade	685,411
Rubbing and polishing machine, H. P. Gale	685,328
Rudder propeller, W. S. Avard	685,368
Sad iron, W. W. Lamb	685,423
Sash balance, A. E. Hewitt	685,331
Sash lock, J. A. Hasenpflug	685,469
Sash lock, F. B. Townsend	685,700
Saw, buck, Nicol & Lionberger	685,291
Saw frame, buck, W. Smith	685,534
Saw grinder adjusting attachment, W. A. Huff	685,609
Saw horse, M. A. Elliott	685,445
Sawmill carriage gear, E. S. Berry	685,560
Saw set, double action, Roberts & Mara	685,644
Scale, computing, H. J. Henrichson	685,330
Scrap bundling press, C. W. Bray	685,565
Scraper and grader, J. U. Sargent	685,350
Scraper and grader, road, Walker & Osten	685,657
Screw cutting tool, J. Dengler	685,264
Sealing sheet metal cans, vacuum, E. Norton	685,428
Separator. See Gas and Oil Separator.	
Shade fixture, adjustable window, F. Winne	685,366
Shade roller, window, G. A. Berlinghof	685,711
Shafting hanger, A. Weed	685,312
Shafting hanging and lining up instrument, R. Kinkead	685,455
Shank stiffener machine, Rich & Reed	685,489
Sheet metal oval or circular frames, machine for making, H. A. Seymoure	685,531
Shield or protector, R. M. J. McHale	685,341
Shingle die, Palmer & Downs	685,294
Shoe horn, A. G. Williams	685,548
Sign, E. L. Nichols	685,630
Sign, transposable or changeable, L. Buckstein	685,251
Signature gatherer, J. E. Smyth	685,535
Silo door, A. Walrath	685,500
Slide gage and try square, combined, Olson & Opland	685,634
Sling support and tripping device, E. W. Wiley, Jr.	685,315
Snap hook, breast yoke, A. R. Otterman	685,525
Snap, whiffletree, H. H. Brown	685,250
Soldering cans, etc., J. McGinnis	685,483
Sound recording and reproducing machine, Osten & Spalding	685,400
Sound reproducing apparatus, G. K. Cheney	685,712
Speed changing mechanism, G. A. Ensign	685,587
Speed regulator, G. Lombardi	685,518
Spike grooving machinery, L. Williams	685,416
Spike grooving machine, L. Williams	685,417
Spike making machine, O. Irwin	685,477
Square, bevel, E. C. Duncan	685,372
Square, T, J. D. Barrie	685,369
Stacker, pneumatic, G. W. Morris	685,628
Stamp mill guide, E. Major	685,622
Stamp retaining device, R. F. Herold	685,514
Steam boiler, H. L. Wilson	685,418
Steam boiler and burner therefor, J. H. Bullard	685,567
Steam engine, C. C. Worthington	685,317
Steam engine, R. H. Botts	685,563
Stock head, A. Huisberg	685,332
Stove feel receptacle, cooking, C. D. Orcutt	685,484
Straightening trough and delivery guide to cooling tables, P. Boyd	685,465
Strainer, A. Sidoti	685,302
Street cleaning implement, A. M. Grey	685,509
Stretcher for artists' use, S. S. Gardner	685,511
Sugar, producing, S. Duffner	685,585
Switch. See Electric Switch.	
Switchboard and fuse box, M. H. Johnson	685,613
Switch controlling device, G. H. Hill	685,279
Switch throwing device, F. P. Frein	685,595
Synchronizer, automatic, J. Pearson	685,430
Table support, F. A. Millikan	685,689
Tabulating apparatus, H. Hollerith	685,608
Tamp, mechanical, W. R. Crane	685,261
Telegraph key, Shirley & Skirrow	685,301
Telegraph or other system, J. Burry	685,571
Telegraph, printing, J. E. Wright	685,390
Telephone power generator, E. Krahenbuhl	685,685
Telephone system, secrecy, F. A. Cumings	685,715
Thermo electric couple, Hermite & Cooper	685,471
Thermo electric couples, manufacturing copper solid rods for, Hermite & Cooper	685,472
Thill coupling, E. P. Bowles	685,564
Thill coupling and antirattler, combined, G. L. Schermerhorn	685,412
Thill coupling, anti-rattling, R. E. Sears	685,436
Threshing machine, E. T. Shelley	685,300
Ticket transfer, Sittner & Geery	685,305
Tiles, quarries, etc., manufacture of, R. Stanley	685,536
Tire or other valve, G. H. F. Schrader	685,649
Tire tightener, W. G. Williamson	685,364
Tires, composition for mending punctures in pneumatic, Scott & Nephew	685,491
Tobacco pipe, G. Stark	685,537
Tool, H. Sommerfeld	685,356
Tool, motive fluid operated, Vaughan & Johnson	685,358
Top, B. B. Ward	685,311
Toy egg, Perkins & Irwin	685,345
Tramways, automatic bucket loader for wire rope, B. C. Riblet	685,387
Tramways, automatic dumping bucket for wire rope, B. C. Riblet	685,388
Trolley, electric railway, E. B. Coon	685,575
Truck, mill, E. Whalley	685,702
Trunk, J. Longshore, Jr.	685,284
Urine tester, E. A. Stars	685,538
Valve, S. Warburton	685,438
Valve gear, engine, C. Robinson	685,490
Valve, hydraulic, Anawalt & Shalkowski	685,662
Valve reseating machine, gate, F. L. Smith	685,697
Valve, safety, J. J. Tonkin	685,496
Vehicle brake, automatic, J. D. Boden	685,246
Vehicle brake, road, Allen & Schumacher	685,240
Vehicle steering device, self propelled, J. H. Bullard	684,570
Vehicle steering mechanism, A. Thompson	685,540
Vehicle wheel, C. Miller	685,627
Vehicle wheel and means for attaching rubber tires thereto, W. J. Kent	685,450
Vehicles, tank filling device for steam propelled, W. B. Mason	685,626
Vending machine, H. S. Mills	685,457
Vessel, cargo, Ferneg & Breuer	685,591
Veterinary mouth speculum, E. W. Cannon	685,710
Vise, screw, C. Rauhe	685,386
Wardrobe and bedstead, combined, Bowring & Barnhart	685,248
Warp beam tension device, C. A. H. Reitsch	685,643
Wash tub cover, stationary, G. W. Everett	685,580
Watch, stop, J. Parkinson	685,635
Watchmaker's tool, R. Leusch	685,338
Water closet ventilation, W. H. Stillwell	685,493
Water purifier, J. J. Rose	685,645
Water raising and distributing system, A. D. Strong	685,495
Weather strip, B. M. Whiting	685,547
Well drilling and operating apparatus, J. Reid	685,641
Welt grooving and beveling machine, E. E. Winkley	685,365
Wheel, J. M. Rankin	685,298
Winding apparatus, yarn or thread, Rivett & Oldham	685,433
Windmill regulator, H. L. Ferris	685,716
Window, E. Bradshaw	685,466
Window tightener and holder, H. D. Trefry	685,309
Wrench, J. W. Grubbs	685,273
Wrench, F. T. Robinson	685,349
Wrench, F. Weimar	685,544
Wrench, F. T. Verharen	685,656
Wrench, G. F. Sprague	685,698
Wrench jaws, producing wrought metal, T. F. Cairns	685,256

DESIGNS.

Clamp or fastener member, M. E. Phillips	35,234
Dish, W. C. Muschenheim	35,232
Display fixture for suspenders, etc., M. Jacobs	35,247
Door check, S. L. S. Stickle	35,240
Garment supporter, F. G. Dietz	35,235
Hat holder, E. H. Stowell	35,246
Hinge member, D. W. Tower	35,238
Hoe, F. M. Solomon	35,242
Knob, D. W. Tower	35,239
Metal ware, branch arm for solid or plated, S. W. Babbit	35,241
Mustache guard, for drinking vessels, strainer, W. H. Snedeker	35,231
Pavements, marginal protecting strip for, D. & A. A. Mullen	35,249
Powder box cap and stopper, C. W. Lunt	35,233
Rug, A. Petzold 35,250 to	35,252
Scraper, mud, J. N. Todd	35,243
Show case, portable, J. T. Robin	35,248
Speculum blade blank, C. J. Pilling	35,229
Spoke holder, J. Jackson	35,244
Spoons, forks, etc., handle for, G. L. Crowell, Jr.	35,230
Tumblers, etc., holder for, L. M. Hooper	35,245
Vending machine case, W. D. Doremus	35,237
Weighing machine case, W. H. Pumphrey	35,236

TRADE MARKS.

Boots and shoes, Frank G. Jones Shoe Co.	37,242
Boots and shoes, certain named, Commonwealth Shoe and Leather Company	37,241
Brushes, R. P. Martin	37,262
Chains, J. F. Sturdy's Sons	37,263
Cigarettes, cigars, and smoking and chewing tobacco, Universal Tobacco Company 37,246 to	37,253
Corsets, corset materials, and underwear, ladies', D. Kops	37,237
Crackers, or biscuit, and cakes, Columbus Biscuit Company	37,254
Disinfectants, Societe Francaise de Desinfection	37,259
Extracts, essences, oils, waters, powders, and soaps, toilet, A. Raynaud & Cie. 37,255 to	37,257
Fabrics, certain named woven, Albany Felt Company	37,234
Feed cutters, carriers, and land rollers, Farmers Mfg. Co.	37,265
Gloves, kid, F. Schmidt & Co. 37,238 to	37,240
Grinding and polishing machinery, Diamond Machine Company	37,267
Leather and leather goods, certain named, American Oak Leather Company	37,244
Leather, certain named, Thomas G. Plant Co.	37,245
Oil, lubricating, Signal Oil Company	37,260
Ointment, H. F. Tripp	37,258
Paints or wall finishes, cold water, Muralo Company	37,261
Soles and heels, cut, Baxter, Schenkelberger & Company	37,243
Spool cotton or cotton thread, Societe Anonyme Filature et Filteries Reunies	37,236
Steel and steel blanks, forms, shapes, and parts, Crucible Steel Company of America	37,264
Thread for sewing and for making lace, L. Jachiet	37,235
Vehicles, motors, and parts thereof, road, Ajax Motor Vehicle Company	37,266

LABELS.

"Bohemian," for malt extract, Western Brewery Company	8,747
"Bully," for cigars, American Lithograph Company	8,744
"Cof-No-Mor," for medicine, I. M. Adams	8,755
"Deliciously Stuffed Dates," for stuffed dates, Reiss & Brady	8,751
"El Falco," for cigars, cigarettes, and tobacco, American West Indies Trading Co.	8,746
"Hartford's the Best Chewing Gum," for chewing gum, Hartford Chemical Co.	8,748
"Laurel," for canned goods, A. von Cotshausen	8,752
"Our Edna," for shoes, L. Franc & Son	8,749
"Peerless Pure Breakfast Cereal," for a cereal food, P. Johnson & Co.	8,753
"Penny Pudding Tablets," for pudding tablets," E. D. Basford	8,750
"Qroil," for a medical compound, C. F. Schneider	8,756
"Red Cross Salve," for salve, Red Cross Salve Company	8,758
"Sal-Nome," for an effervescent laxative salt, Nome Chemical Company	8,757
"Tar Heel Kidney Tea," for a medicine, C. D. Higgins	8,754
"Vista Del Ray," for cigars, Schmidt & Co.	8,745

PRINTS.

"Autobav Shoe," for shoes, Smaltz-Goodwin Company	415
"Our Edna," for shoes, L. Franc & Son	414
"Pittsburg Souvenir Playing Cards," for playing cards, W. J. Gilmore & Co.	413

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Inquiry No. 1555.—For a small gasoline engine ½ h. p. with governor.

Inquiry No. 1556.—For manufacturers of gasoline engines with tube ignition.

Inquiry No. 1557.—For manufacturers of parts of gasoline engines.

Inquiry No. 1558.—For manufacturers of machinery for making glass insulators for telephone and telegraph wires.

Inquiry No. 1559.—For a ramie defibrating machine.

Inquiry No. 1560.—For manufacturers of electric signs.

Inquiry No. 1561.—For parties to undertake the manufacture of a special automatic electric switch.

Inquiry No. 1562.—For manufacturers of flagpoles.

Inquiry No. 1563.—For the manufacturers of the Gorin multigraph.

Inquiry No. 1564.—For parties to make a small tool with aluminium handle.

Inquiry No. 1565.—For transfers for use in outside advertising.

Inquiry No. 1566.—For manufacturers of unique advertising novelties.

Inquiry No. 1567.—For up-to-date novelties.

Inquiry No. 1568.—For parties to make a quilting frame.

Inquiry No. 1569.—For the manufacturers of the Lotrent sliding door hanger.

Inquiry No. 1570.—For dealers in castings for ½ or ¾ h. p. gasoline engine for a tandem bicycle.

Inquiry No. 1571.—For manufacturers of well casings.

Inquiry No. 1572.—For a machine for threshing, hulling and cleaning rice.

Inquiry No. 1573.—For brick machinery for making pressed brick.

Inquiry No. 1574.—For an amplifying telephone receiver.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(8420) G. E. D. asks: Are the exciting balls of a wireless telegraph instrument immersed or rubbed with vaseline or other oil in the best modern methods? A. No. 2. Are choking coils used in the receivers of the instruments? A. No. 3. What would the height of the wires have to be for telegraphing the distance from one and one-half to two miles? A. We think from 20 to 30 feet will answer. 4. Is it practicable to use the instruments in a city with large buildings? A. Yes.

(8421) J. F. K. writes: In answer to F. S. (8241), issue of July 6, 1901, you say there is no destructive local action between the oxide filling and the grid of a storage battery. How is this to be explained, as there appear to be all things necessary for a galvanic cell—metallic contact between different conductors and simultaneously liquid contact between the same? This has been a difficulty of which I have not been able to get the solution. A. You will find the solution in Treadwell's "Storage Battery," page 120, price by mail $1.75. Local action is avoided by avoiding contact between the conducting grid and the liquid electrolyte. This is accomplished by having an unbroken layer of peroxide upon the surface of the grid. If this is broken by any means, the battery deteriorates by local action.

(8422) A. M. asks: Please let me know what I would need to cause the sound of a clock to be transmitted a distance of, say, 150 feet by electricity. A. A simple device would consist of a telephone transmitter in front of the clock and a receiver at the point at which you would hear the ticking.

(8423) B. F. V. writes: Will it affect the quantity of gas consumed in a building whether the gas is turned on full at the meter and partly turned off at the burners, or partly turned off at the meter and fully turned on at the burners? Assuming the same number of jets burning and the same illuminating power in both cases. A. There is a very slight difference in the volume of gas due to the pressure at the meter and the proper pressure at the burner jet, which indicates a saving of gas by the meter measurement at the higher pressure or by regulating the pressure at the burners instead of at the meter.

(8424) J. W. D. asks: 1. How long does it take to decompose one pound acidified water with a current of 100 volts? A. The time required to decompose a pound of water depends upon the amount of electricity used. If 13½ amperes are used at 100 volts it will require one hour. From this the time for any other current can be found, or the current for any other time. Water is decomposed with any voltage greater than 1.47 volts. You will see then that 100 volts is very much higher than is necessary. 2. How much does it cost to run a dynamo of 1,000 volts annually, including all expenses? A. That depends upon how many amperes the dynamo is to furnish. A dynamo giving 1,000 volts might be lighting a small village, or it might be lighting a large section of your city. The cost would not be the same in both cases.

(8425) G. G. S. asks: Please inform me as to the amount of current used by (1) ½-inch solid carbons, (2) ½-inch soft core carbons, (3) ⅝-inch solid carbons, (4) ⅝-inch soft core carbons, when used in a stereopticon on 110-volt alternating current circuit. A. Stereopticons are usually run with ½-inch carbons. We have never used one with a larger carbon. The ½-inch carbon will carry as high as 25 amperes, but 10 to 15 amperes is the usual current for such a lamp. A ⅝-inch carbon would carry 25-16ths as much current as a ½-inch carbon. The current would be proportional to the area of cross section of the carbon.

(8426) J. V. J. asks: 1. Why are open circuit telegraphs not used as often as closed circuits? A. The calling apparatus requires a closed circuit. 2. Can the duplex be worked on them? A. We do not know as to the possibility. Many things are possible which are not practicable. 3. Does an arc lamp when placed under water decompose? A. No. It heats the water. 4. Can a person get a shock from one carbon-zinc cell? A. Not from the battery alone. 5. Can an electric motor be driven both ways to advantage? A. Yes. Street car motors are reversed very often.

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(8427) C. O. H. asks: 1. In regard to the article on wireless telegraphy in a late issue of SCIENTIFIC AMERICAN, will you please inform me at what distance it will work over land? A. This question is answered in the article referred to. It is there stated that a ½-inch coil will transmit ¼ to ⅓ mile over water, but that the writer has sent messages to a distance of a mile. It is also stated that messages can be sent about ten times as far over water as over land. About 1-10 of a mile is therefore the distance to which one may expect to send a message over land with a ½-inch coil. 2. Can the radiator plates be hidden from each other by trees and houses. A. Yes. 3. Also please mail me the SUPPLEMENT containing directions for making a Ruhmkorff coil which you consider the most suitable for the above. A. We can send you SUPPLEMENT 160 for ten cents. This gives full details and drawings of a coil giving a spark 1½ inches long.

(8428) N. A. B. asks: 1. How long will the glass tube have to be to make coherer described in SCIENTIFIC AMERICAN of September 14? A. Almost any length from an inch to two inches. Length not important. The drawing in the article shows a wire 1-16 inch in diameter in the tube. You can get the length of the tube in the drawing from this dimension of the wire. It is sixteen times the thickness of this wire. 2. Will a wireless telegraph work well when the instrument is higher than the point of aerial wires or when sender or receiver is higher and the other is lower? 2. Yes. The waves by which the message is transmitted go out from the transmitter in the form of spheres or rather spherical shells, up, down and in all directions. They enter the earth for a distance, but pass through the air more easily and go to greater distances, all around the transmitter, north, south, east and west. In any direction the messages can be received if one has a receiver. These messages do not go in one direction, as on the ordinary telegraph lines.

(8429) C. B. H. asks: 1. Can you give me a good formula for blue-print paper, not difficult to make? A. Take 1 gramme of citrate of iron and ammonia, and dissolve in 5 grammes of water. Make a second solution of 1 gramme of ferricyanide of potash in 5 grammes of water. Mix the two in the dark and apply to the paper. 2. In your issue of June 8, 1901, page 358, in an article on "A Whistling Arc": (a) What is a one-third M. F. condenser? (b) Is the ten-ampere arc light necessary? How large or small a current might be used? (c) What current does the storage battery give? (d) Would the ordinary telephone cell do? A. (a) A microfarad is the unit of electrical capacity. The letters M. F. are used as an abbreviation for microfarad. (b) We presume the ordinary arc lamp is implied in the article. We have not tried the experiment. (c) A storage battery gives a current which varies with the size of the plates. They are made so large that the lamps of a big station can all be lighted with it, and so small that it can be carried in the pocket to light a tiny lamp on the scarf pin. (d) We presume it would do.

(8430) W. writes: A boiler which has a 2-inch feed pipe and 2-inch check valve reduced to 1½-inch discharge, the size the pump calls for. A 2-inch pipe extends from boiler 4 feet to check valve, and also 2-inch pipe continues from check about 4 feet, when it is reduced to 1½ inches. A claims that there is one-quarter greater resistance on the pump than should be or would be if there was 1½ inch check valve. B claims it has nothing to do with it, but that if even the check valve was larger it would not affect the pump. Who is right? A. B is correct. The larger size of the check valve makes no more work for the pump. If anything, it favors the work of the pump, causing less friction and resistance.

(8431) J. M. C. asks: 1. Are there transformers made for direct currents? A. Yes. They are called rotary transformers, or converters. 2. Are 500-volt arc lamps made and operated successfully? A. No open arc light uses over 50 volts. It cannot. Inclosed arc lights use about 80 volts. Upon circuits of higher voltage as many arc lamps are put in series as will use up the voltage. On 500 volts ten arc lamps will burn in series. 3. Is there a chemical preparation or the like, by which I may be able to clean fiber of oil? A. We do not know anything better than potash. 4. By cutting off a trolley pole, say, two feet, does it increase or decrease the pressure against the trolley wire? A. It will bear harder against the wire the shorter it is. 5. Has copper ever been hardened to any great extent? A. Not in modern times. It is considered one of the "lost arts" to temper copper. 6. Do you consider the best of lightning arresters a success? A. They are considered indispensable. We do not advertise any goods in this column. 7. If there is such, what do you consider a perfect, at all times waterproof insulation? A. India rubber. 8. Has electricity, as yet, been taken from the earth? A. No more than has been put into the earth. No one has drawn it from the earth for doing work.

(8432) A. H. asks: Please describe how salammoniac is obtained or produced. A. Salammoniac is prepared from the ammonia water of the gas works, by the addition of hydrochloric acid.

(8433) M. C. A. asks: Will you please inform me what size and how many feet of wire it will take to make an electric heater, 104 volts, say 5 to 7 amperes capacity? A. Seven amperes at 104 volts require 15 ohms of resistance. For a rise of 190 degrees F. the resistance rises 40 per cent. Hence about 5-7 as much wire will be needed if you wish to raise the temperature about to that of boiling water. No. 14 iron wire may be used. This has about 65 feet to an ohm. These are approximate numbers, and you can adjust the quantity to the temperature you wish to maintain.

(8434) E. B. S. writes: I have a dynamo that gives 25 volts and will light two 16-candle power lights. Must the light be rated at 25 or will it light two 110-volt lamps and how many one candle power lamps of 100 volts will it light? A. Your dynamo, rated at 25 volts, will do anything which a pressure of 25 volts will do; but it cannot do work requiring 100 volts. It cannot light any 110-volt lamps. The lamps for this dynamo must be 25-volt lamps.

(8435) E. L. S. asks: What is the voltage of the hand power dynamo in "Experimental Science" when wound as directed with No. 16 wire on fields and No. 18 armature? What sizes of wire should be used to give an E.M.F. of 25 volts? About how much wire will be required in each case? A. The hand power dynamo gives about 3 amperes at 12 volts. The voltage would be doubled by doubling the number of turns on the field. For the field as designed, about 5½ pounds of No. 16 B. & S. wire are required, and for the armature about ½ pound No. 18 is required.

(8436) J. W. J. asks: Have you plans in any of your SUPPLEMENTS of a dynamo that will charge storage battery described in SUPPLEMENT No. 1195? If so, state what number or numbers? A. The dynamo described in SUPPLEMENT No. 600, price ten cents, will charge the storage battery of SUPPLEMENT No. 1195.

(8437) A. W. P. asks: 1. I am building a 10-inch spark coil, and wish to insulate it with some kind of oil. I have allowed an inch space between primary and secondary, in addition to a thin fiber tube enveloping the primary. I have tested linseed oil (boiled) and kerosene, finding the latter a somewhat better insulator; but the odor is more objectionable. Can you advise me on the subject? A. Any heavy petroleum oil is a good insulator for a coil immersed in it. We do not know how to get rid of the odor of any oil. If inclosed in a tight box the odor will not be perceived very much in the room. 2. I have seen several accounts of Roentgen rays producing acute dermatitis and causing the hair to fall out. Will you please explain to what extent this danger exists, and what means, if any, may be taken to prevent its occurrence? A. The danger of producing X-ray burns is very imminent if the operator is inexperienced or the tube is not properly shielded. The best mode of avoiding these burns is to have an apparatus which will do its work so quickly as to not produce them. It is, however, prudent to cover the patient in the parts exposed to the rays with a piece of aluminium foil which is grounded to a gas or water pipe or has a wire carried to earth. 3. In an interrupter where the circuit is quickly broken under water, is it necessary that the contacts be made of platinum? A. The same heat is produced in breaking a certain current under any circumstances. If water is interposed, the heat is carried away more readily, but the spark and heat of the break is able to burn the wire, and platinum should be used for the terminals.

(8438) J. E. P. asks: 1. In substituting a button to throw the drop at the central telephone station, how many Mesco dry cells will be required instead of the magneto-electric machine usually used in small towns? A. This depends upon the distance from the central, and the number of telephones in series if the line is a party line. It may be that a small number will do the work. Experiment is the solution probably in this case. 2. What cells would you consider preferable for this charge? A. There are a number of dry cells differing but little from each other. We have no recommendation to give to one of these over another.

(8439) W. H. P. asks: Can you give me the address of a manufacturer of a light to illuminate porch and grounds, not using gas from the street main? A. No. We cannot give any advertisement to any one in this column. Our advertising columns are the place to refer for addresses of dealers. Within a few weeks there has been an advertisement which exactly fills the bill for you. The light is that of acetylene.

(8440) G. S. T. writes: Will you kindly give me your opinion of the following statement made here to-day: That a cube of iron one inch square, being dropped overboard at the greatest known depth of the ocean, would not sink to the bottom, but that there is a depth where it would be held in suspense. A. The cube will drop to the bottom of the ocean at the greatest depths. Anything that is heavier or has a greater specific gravity than salt water sinks to the bottom at all depths. The compressibility of sea water is only about 0.000044 of its bulk per atmosphere of pressure and not materially denser at great depths; thus at a depth of a mile its density would be only

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about 1-130 greater than at the surface. Sand and mud sink to the bottom of the ocean at great depths, and shells are dredged from the deepest seas.

(8441) C. R. M. asks: I want to get the table for carrying capacity of copper wire and German silver wire. I have seen tables run as fine as 26 B. & S. gage, but not any finer. I would like to get a table or a way to figure for finer wire if possible. I also would like something on the size of wire to use on motors and dynamos. A. A finer wire than No. 18 has no carrying capacity, since its use is not allowed by the fire underwriters for wiring buildings. The wires in dynamos and motors are selected on the basis of 2,000 to 3,000 amperes per square inch of cross section in ring armatures, and even 4,000 amperes in drum armatures. In magnet coils only about 2,000 amperes per square inch is allowed.

(8442) A. L. S. asks: 1. In the engineering notes of your paper for September 28, 1901, there is a paragraph on obtaining oxygen from the air, stating that it can be mixed with water gas for lighting. Is not this an explosive mixture? A. A mixture of oxygen from the air and street gas is explosive in certain proportions; but in the burning of these in a jet the fire cannot get at the mixed gases till they are ready to be burned, as in the calcium light jet. 2. Also, will you kindly give the principle of the Nernst lamp? A. The Nernst lamp employs a thread of a substance like that used in the Welsbach mantle. This, heated to a white heat, gives out light.

(8443) J. N. P. asks: Kindly furnish me with explicit definition of the term "equivalent focus," as applied to a compound photographic lens. Give one or more rules, as free from mathematics as may be, for accurately determining the equivalent focus of such a lens. Is the relation of diaphragm aperture to focal length of a lens based upon the actual or equivalent focus? How can we determine the diameter of the circle of illumination of a lens upon which its covering power is dependent, since this dimension varies with the distance between lens and ground glass? A. The equivalent focus of a photographic combination is "the focal length of the single lens which will produce the same sized image." This focus is measured from the optical center of the lens. It is not the "back" focus. Several methods are given for measuring the equivalent focus in Taylor's "Optics of Photography," price $1 by mail.

NEW BOOKS, ETC.

RACES AND PEOPLES. Lectures on the Science of Ethnography. By D. G. Brinton, A.M., M.D., Ph.D. Philadelphia: David McKay. 1901. 16mo. Pp. 313.

The lectures which appear in this volume were delivered at the Academy of Natural Science, Philadelphia, 1901. They have since been written out and references added to a number of works and articles which will enable the student to pursue his reading on any point on which he may be interested. The late Dr. Brinton was a man of great scholarship, and his lectures were always sure to be interesting. The present volume is calculated to give the student an excellent grasp of the subject.

DICTIONARY OF PHILOSOPHY AND PSYCHOLOGY. Written by Many Hands and Edited by James M. Baldwin. In Three Volumes. With Illustrations and Extensive Bibliographies. Vol. I. London and New York: Macmillan Company. 1901. Pp. 644. Price $5.

The work which lies before us surely fills a long-felt want. An examination of the book convinces us that for scholarly treatment and trustworthiness of definition of the various philosophical and psychological terms it could hardly be improved upon. Not the least novel feature of the book is the translation of each English term into French, German and Italian. Both publishers and editors are to be congratulated on the publication of this first volume of a work which promises to be of the utmost value to the student of philosophy.

DAS BUCH DER EXPERIMENTE. Von A. v. Schweiger Lerchenfeld. Vienna: A. Hartleben. 1901. 12mo. Pp. 392. Price $1.50.

We sent for a copy of this work, hoping that it would contain some new and interesting experiments, but in this we were disappointed. We find that the bulk of the book is made up from matter taken wholesale from "Experimental Science," and a large part of what remains is from the writings of Tissandier and Arthur Good. The book appears to have been "lifted" from foreign sources, with the possible exception of a few of the last chapters. We think it would not be too great a task for the foreign publishers to ask permission before taking thirty-five illustrations and republishing them, but having done so at least proper credit could have been given. The work itself does not call for any special comment. It is superficial and, if the foreign material were removed, it would be worthless.

ZOOLOGY: AN ELEMENTARY TEXTBOOK. By A. E. Shipley, M.A., and E. W. MacBride, M.A., D.Sc. New York: The Macmillan Company. 1901. 8vo. Pp. 632. Price $3.

The authors have written an elementary treatise on zoology which can readily be understood by students. The diagrams are particularly clear, and the book will certainly prove very valuable as a textbook and for those who desire a fairly scientific but not very extensive work on the subject. One sentence in the preface is particularly gratifying; it is: "It has been drawn up with an eye to no examination, and does not claim to correspond with any of the numerous syllabuses and schedules issued from time to time by the various boards of examiners scattered through the United Kingdom and North America." By North America the authors may mean Canada; we certainly do not have this bad system in the United States.

STEEL SHIPS. Their Construction and Maintenance. By Thomas Walton, Naval Architect. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Company. 1901. 8vo. Pp. 290. Price $5.50.

This work is largely the outcome of the gratifying reception accorded a smaller work ("Know Your Own Ship") by the same author. The work opens with a condensed description of the manufacture of steel and iron, and is followed by a chapter which treats of the strength and quality of ship steel and iron and describes the tests which are applied to ship steel. Then follow chapters explaining what is meant by a vessel being "classed," and by another which forms an introduction to the subject of ship construction, and explains its principal structural features, and the alternative methods employed. Then follows a chapter dealing with the various forces which are exerted on the hulls of ships tending to strain them and produce deformation. Chapter VI. describes first the fundamental types of vessels, and then proceeds to describe the construction of typical vessels, such as the "Campania" and "Great Eastern," and the "turret," "trunk" and "self-trimming" steamers. Chapter VII. deals in detail with the construction and combination of the various parts that go to make up the whole ship structure; and the last chapter deals with the causes of decay and deterioration and the best means of combating them. The work is profusely illustrated with working drawings, showing the various types of ships both in general arrangement and in detail. It also contains a large number of good half-tone engravings of the types of vessels treated of. It is a practical work, clear, concise and compendious.

PRACTICAL ELECTRIC RAILWAY HANDBOOK. By Albert B. Herrick. New York: Street Railway Publishing Company. 1901. 16mo. Pp. 407. Price $3.

For the size and character of the work, we have never seen a handbook that contained so large an amount of practical information as this. The data through the whole volume bears the stamp of having been compiled by practical men, for a practical purpose, a feature which will recommend it to every street railway engineer. The volume opens with several pages of general tables, and this is followed by eight sections devoted to testing; the track; the power station; the line; the car-house; the repair shop; the equipment, and the operation. A special feature of the book, which cannot be too highly commended in an electrical handbook, is the very liberal use of clear, and amply lettered and dimensioned line-drawings and dimensions. These are chosen with discrimination and will be found invaluable, especially to that large body of practical electricians who, by availing themselves of night schools and home study, are qualifying themselves for higher and more remunerative positions in electrical engineering. Mathematics and formulæ are used with discrimination, and only as much of these is used as the scope and purpose of the work demand.